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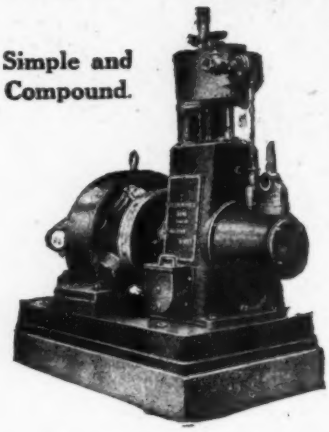

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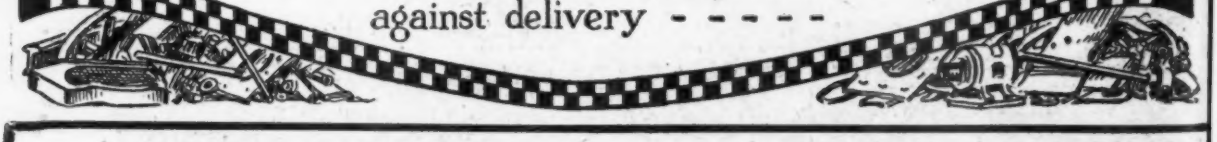

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VOL. LXXXV. JULY 11, 1919. No. 2,172.

ELECTRICAL REVIEW.

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LORD SYDENHAM ON INDUSTRIAL PROBLEMS.

IN his presidential address to the British Science Guild, Lord Sydenham endeavoured to assign causes and to suggest remedies for some, if not all, of the unrest which characterises the industrial situation at the present time. Science is responsible to some extent, he thinks, and science certainly can do much to improve the outlook for the future.

The immunity of the British nation from the wreckage caused by the Napoleonic wars, together with the immense resources of the country in coal and iron, made Great Britain in 70 years the workshop of the world. How far are the conditions which then existed reproduced to-day? Our state as regards wreckage is better than that of any belligerent nation, with the possible exception of America, and there is no neutral nation having at the same time the resources and the development which are ours. The part played by coal and iron in coming expansion will not be so obvious, nor so unique, as was the case a century ago. Electricity is the great natural resource to-day. Electricity is generated by the aid of coal, but it is to developments in the economical generation, transmission, and, above all, application of electricity that we must look for that enormous increase in productive effort which must come if we are to avoid slipping backwards to a state of chaos, bankruptcy, and ruin. Labour troubles will occur in other countries as well as here. They threatened to uplift their heads in America and Germany before the war, and they will come in those countries, as they will also in Japan. We do not say this in any gloating spirit, but the processes of growth show a marked similarity in similar organisations, whether individuals or communities. The present disturbances, of which Britain, as a nation, has her full share, are of a different character, and arise from causes which have little in common with those of earlier labour troubles in this country. The right to organise and the right to strike have been won for the British worker. Workers in Japan, for example, have not fought this battle, and they will have to fight it sooner or later.

The comparatively short distances for transmission should result in more economical and reliable working as compared with countries not so densely populated, and the absence of extreme climatic conditions should help to make overhead transmission easier, as well as less subject to interruption through snow and tempest.

If, then, we have, as we believe is the case, certain natural advantages, it is our especial duty, particularly at this time, to make every possible use, and the greatest possible use, of these advantages and of our own ability to apply them to the service of mankind. The immense debt piled up in the war amounts to the mortgaging of production. Production is the only thing that can pay it off. Money cannot do it. Were the whole five thousand million pounds of the German indemnity paid to this country in golden sovereigns at this moment, the only result would be that we should own a few thousand tons of yellow mineral the more, and prices would immediately rocket to a higher level than ever. We have to produce the means whereby we live, and in addition, the surplus necessary to repay the amounts raised for the purpose of carrying the war to a successful conclusion. Clearly the more quickly this can be done, the better. Many things are necessary. The active co-operation of labour is the one of which most is heard, but equally necessary is the combination of business organisations and the pooling of resources which is seen on every hand. Provided this is carried out in an enlightened spirit, care being taken to avoid the snares and pitfalls

besetting the way—some of which we pointed out a week or two ago—nothing but increase of prosperity can come of the increase of resources. The trained technical men, the brains of industry, must play their part. Organisation will help them, too, and we believe that has been realised.

But to return to Lord Sydenham. He ascribes the slum trouble to the rapid development of industry. Slums, or the majority of them, were built in more ignorant times, but no-one will build in the future such airless, lightless, waterless hovels as have wrecked, and still are wrecking, the lives of thousands. Everyone now knows the rudiments of what is necessary for healthy existence, just as everyone is better educated in every way to-day than their predecessors were a hundred years ago. Lord Sydenham hopes as all must hope, that all grades of workers will know more of the economic facts and conditions governing the industries in which they are employed. Ignorance in this respect enabled the Fabian Society, 30 years ago, to state that the workman only received one-third of the value of the results of his labour. So says Lord Sydenham, and he characterises the statement as a "wild fallacy, which could easily have been refuted by the publication of simple explanatory figures." Possibly—possibly not. We observe that Lord Sydenham does not produce any figures, and we shrewdly suspect that they are not so simple as he would have us to believe. The workman certainly received far less than was right, and even now, although wages are at levels which would have given our fathers fits, the workman does not, on the whole, get more out of life than he deserves.

Large numbers of men, Lord Sydenham says, were taught by Trade Unions that it was a duty to be dishonest. Now, this is a statement of opinion, and ought to be backed with examples. If these cannot be produced, then the statement should not be made. This is the kind of thing that embitters controversy, and does the asserting side no manner of good. The notion of "Whatever I say three times is true" will not work in real life.

Increase of wages, we read, causes reduction of output. This is said to be contrary to American experience, and the coal situation is adduced as an example (the only one). The coal situation at present is entirely abnormal, and must be allowed time to clear. The fact is that in this country, not only among manual workers but among the professional and technical classes, increase of output has very often—in fact, almost invariably—been followed by reduction of rate. Examples will occur to many of our readers in their own experience. Wages must necessarily have an effect on prices; but by proper encouragement, resulting in increased output, this effect can largely be offset.

From a complaint of the ignorance of the working class we are led to a condemnation of the nationalisation of coal mines. Finally, we are told that labour unrest is due partly to real grievances, partly to fallacies of a ludicrous nature, and partly to the combined machinations of Germans, Russians, and, to a minor extent, Indians. Lord Sydenham's great experience of India must be respected. But what British workman takes any part of his political opinions from Indians? He is more likely to look on them, and speak of them, as "adjectival niggers."

To say that science has caused some of the evils of to-day is to express a truth wrongly. Science, knowledge, is good; man perversely makes a wrong use of it. And education is not to blame for man's perversity, but the lack of a sufficient quantity of the right sort of education. Lord Sydenham sees the necessity for increasing the flow of talent from the ranks of manual labour to those of brain work, and as we have pointed out over and over again, this most important end can only be accomplished by increased opportunities of an educational character. More scholarships, the removal of the handicap of poverty, and particularly of genteel poverty—this is the direction in which most work needs to be done. The new organisations of technical and scientific workers must keep the education of the forthcoming generations in the forefront of their policy. If they do not, then whatever passing good they may do the present generation of their kind, they will die of inanition as time goes on. An active constructional policy is here required, and if it is forthcoming, the problem of middle-class organisation will be in a fair way to be solved. Such organisation must come, and can only come, from the inside, by a coalescing of groups of organisations. It will never come by external pressure, or arise from the well-meant formative efforts of popular legislators.

Unrest is a feature of the industrial situation in regard to capital, to the technical worker, and to the manual worker. An increased understanding of the mutual dependence of these three is needed by all of them. But let it not be forgotten that capital needs this increased understanding as much as, if not more than, the others. "Revival of trade would have come much earlier had the world been convinced that there was some finality to the demands of labour," said Mr. Roscoe Brunner to his shareholders' meeting. By the nature of things there cannot be, in the vicious circle of decrease in the value of money into whose vortex we have been drawn, any finality of any kind. The poorest will always be the one to feel the pinch, and to make most noise. Levelling up is the only way to improve the situation, and education is the high road to that end.

The Electricity (Supply) Bill.

Now that the Bill is well under way, it may be an opportune moment to try to take a dispassionate survey of the situation generally.

First of all, it appears to be the unanimous verdict that some sort of Bill is necessary. All parties are agreed that under the existing system, or want of system, electricity cannot be made universally available at bed-rock prices for essential industries. Not only must restrictions be removed, but someone or other must be empowered to exercise compulsion where domestic jealousies, or what not, prevent mutual co-operation. How else can we bring a heterogeneous collection of, say, small municipalities into line? Obviously, we must have Electricity Commissioners armed with very wide powers. These Commissioners will be charged with administrative duties which will demand their whole attention; they cannot actually own and run the generating stations. Hence, there must be some body, or bodies, provided for this purpose, the precise constitution of which must naturally be determined by the circumstances incidental to each locality.

In order to fulfil the functions assigned to them, these bodies must have powers of compulsory purchase, without which they would be powerless to deal with recalcitrant undertakings. Reorganisation of the industry is, by common consent, agreed to be indispensable to the success of electricity supply; the Commissioners may lay down the principles to be followed, but they cannot handle the details in each area, and therefore they must devolve their executive powers upon bodies especially constituted to carry out the reorganisation. It is difficult to imagine any other practical course by which the desired results can be obtained, and the scheme outlined above has been cordially welcomed by nearly all the local authorities.

But opposition to the scheme is offered by the supply companies, which have put forward two suggestions. One, abandoning any attempt at structure, proposes that the Commissioners shall have very full powers, but that District Boards shall be omitted. In their absence the Commissioners would have to rely on the voluntary co-operation of existing undertakings in the various districts, and anyone can see the hopelessness of expecting results from such a procedure. The second proposal is like unto the first in that it would also do away with District Boards, but it goes on specifically to curtail the powers of the Electricity Commissioners, thus further lessening the prospects of success. It will be seen, therefore, that outside the structure embodied in the Bill no other proposal even pretends to fit the case; and in the absence of anything in the nature of an alternative constructive policy, we cannot doubt that the main principles of the Bill will inevitably be adopted by Parliament.

We do not suggest, however, that the Bill does not require drastic amendments in detail. There are vital points, such as the terms of purchase and the price of bulk

supply, which call for radical revision. But it does not appear that the structure of the scheme generally can be other than that laid down in the Bill.

Let us now consider how the Bill will affect the interests of (*a*) undertakings; (*b*) consumers; (*c*) the public. Provided that the Bill is so amended that the undertakings are justly dealt with, it is difficult to see that they will be adversely affected by its operation. Certainly to small isolated undertakings it will come as the best of good fortune for them to be relieved of the troubles of generating, and to be able to get a bulk supply *ad libitum*. Their capital expenditure difficulties, which seem in the future to be insurmountable, will practically disappear.

The proposal put forward on behalf of consumers, to curtail the powers of the Electricity Commissioners, and to defer action for two years or so, seems hopelessly impracticable and ill-advised. Ordinary consumers can extract no benefit from such a course.

One of the principal aims of the whole movement is to ensure a cheap supply of electricity to industrial consumers, the realisation of which would carry with it a cheap supply to other classes of consumer, and there is no room for doubt that eventually that result will follow the reorganisation of the supply industry. By killing the scheme—for that would be the effect of this proposal—consumers have no prospect of advantage to themselves or to the nation.

The public, apart from the hope of a cheap and universal supply, are mainly concerned with the question of finance. The Bill provides no means for safeguarding the scheme against loss. If there is a loss, the public, as tax-payers, will have to foot the bill. But it certainly seems better to take the risk than to sit still and to perpetuate an admittedly deplorable state of affairs. At any rate, any financial argument tells against the Bill *as a whole*, not against the structure of the scheme.

Subject to the necessary amendments, there seems no reason to fear that the existing undertakings will endeavour to crab the scheme. Will it not be to everyone's interest to work together? The Electricity Commissioners certainly will want everything to work harmoniously. Although they will be in a position of authority, they cannot possibly attain success unless they induce the District Boards and the undertakers loyally to do their best. Further, unless the undertakers as distributors are treated considerately all the way through, they are in a position to thwart the aims of the District Boards right and left. It would pay no one to get to loggerheads. Moreover, the future of undertakings as a whole in view of labour and other troubles has been by no means rosy. But under the Bill, they become part and parcel of an organisation the good working of which Parliament is pledged to support.

As a matter of fact, what everything will depend on is whether the right men are chosen not only for Commissioners, but also for all the subordinate administrative posts. This is a matter which obviously cannot be settled by Act of Parliament. Fortunately, however, the industry is well off in respect of capable engineers and business men, armed with the testimony of proved results. There is no lack of material provided the selection be discreet and free from political or other irrelevant considerations. The nomination of Sir John Snell as Chief Commissioner is a good beginning, and augurs well for the future; we are confident that he will see to it that the success of the scheme is not imperilled from the start by the exercise of political chicanery and undue influence in the appointment of his colleagues and subordinates.

Need for Action in Serbia.

The interim report of the British Economic Mission to Serbia is summarised in a recent issue of the *Board of Trade Journal*. One point in it, in particular, requires emphasising and bringing forcibly to the attention of British engineers. We believe it has had their attention to some extent, but much depends upon whether it has been followed up adequately. It is stated that there are not more than 70 constructional engineers, architects, and surveyors in the whole of Serbia. The French have already done much to place technical officers at the disposal of the various public departments in Serbia, and similar help from England would be gladly welcomed. There is no reason why the granting of such assistance should not bring its own reward by attracting to British industry orders for the engineering material for which it has earned a just reputation in every class. Qualified technical men must be sent out to advise as to the steps needed in reconstructing the industrial life of the country in the most rapid and economical manner. If such a course is needed in Belgium—which before the war was a model of technical organisation—how much more is it necessary in Serbia, in which industrial development had scarcely passed the stage of infancy. Factories did exist, but few of them had an annual production worth more than £50,000. The work upon which the immediate aid of the Allies is called for comprises, in the first place, the restoration of communications. When the Save bridge at Belgrade and the Morava River bridge are restored—which it was hoped would be the case, at any rate, temporarily, by the beginning of July—the Belgrade-Nish-Salonika main line can be re-opened. Before, however, full railway communication can be resumed there is skilled labour and engineering material to be applied in the restoration of station buildings, junctions, sidings, sheds, shops, turntables, turnouts, telegraphs, telephones, &c. The country can pay for what it wants. Prospective purchasers incline first to Great Britain and then to our Allies. If they do not meet with a proper response it is obvious that they will incline to their former business connections—namely, the Central Powers.

The Telephone Service.

Complaints in the lay Press about the quality of the telephone service are, unfortunately, by no means novel; but, rarely, if ever, has there been such a violent and continuous storm of wrath as has been observed during recent weeks. So far as the merits of the service are concerned, we cannot pretend that the outcry is not justified—the complaints are only too well founded; our only scruple arises out of the undoubted fact that the war has exercised a very detrimental influence upon the labour resources of the Telephone Department. The staff has been seriously depleted of trained workers, and those who have taken their places are, as yet, far from efficient substitutes, while the demands upon the staff for new connections and the number of calls per diem have very considerably increased. The Department is, therefore, labouring under exceptional difficulties for which it cannot be held to blame, and for which due allowance should be made.

The trouble is by no means confined to London; complaints pour in from the Provinces also, and demands are made for the substitution of the automatic for the manual exchange. Undoubtedly that course is highly desirable, but the change will be a matter, not of months, but of years, and will make heavy calls upon the technical staff, as well as upon the financial resources of the undertaking. Now that labour has become so much more costly, the prospects of the automatic system are distinctly brighter, and the improvements that have been made in automatic working further strengthen its case. In the meantime, London will continue to suffer from the vagaries of the service, which is being held up as a terrible warning of what may be expected from nationalisation in other directions. We have a clear conscience, remembering that we uttered that warning time and again when the transfer of the National Telephone Co.'s system to the State was under consideration; but we would far rather have seen our gloomy predictions falsified than verified as they have been.

One of the fundamental defects of the State system of control is the inevitable development of mediocrity; the State, apparently, dare not pay the price for the best men. The highest salary in the Post Office engineering department, we believe, does not exceed £1,200 a-year, a ridiculous remuneration for so onerous a post, which should be occupied by the most energetic, progressive, and up-to-date engineer that could be found, at a corresponding salary, and with freedom to select his assistants to suit his needs. A system which depends upon promotion by seniority can never be anything but mediocre and inefficient.

DEPTFORD ELECTRICITY WORKS REVISITED.

There are certain places which to the electrical engineer—especially to him of maturer years—possess a degree of interest derived from old associations which render them, so to speak, hallowed ground. Such a place, for instance, is the little town of Como, where Volta lived and died; or the Royal Institution, where Faraday discovered electro-magnetic induction; or the Natural Philosophy Laboratory of Glasgow University, sanctified by the genius of Lord Kelvin. With these world-famed places we do not hesitate to class the Deptford Electricity Works of the London Electric Supply Corporation, Ltd., for there, 30 years ago, Ferranti enunciated and carried into effect the fundamental principles of concentrated generation and high-pressure transmission of electrical energy, which to-day are recognised the world over as the soundest engineering practice. There the innumerable problems associated with the construction and operation of large generating sets, the control of alternating currents at a pressure then unprecedented, and the transmission of current at 10,000 volts through mains seven miles to London were first worked out, practically every detail involving new departures in design. As long ago as 1886, the parent company was supplying 30,000 lamps with overhead distribution, in an enormous area, from the Thames to Regent's Park, and from Knightsbridge to Temple Bar; and when it was decided to build the Deptford works, the Corporation started with a capital of £1,000,000. At that early date, the site was selected with a view to obtaining an ample water supply for condensing purposes, and cheap sea-borne coal, with room for extensions.

At the invitation of Mr. G. W. Partridge, chief engineer, last week we visited the works and inspected the plant, both old and new. We were interested to see Ferranti alternators at work, each driven by a Hick-Hargreaves vertical engine of 1,500 H.P.; these sets, which generate at 10,000 volts, were by far the largest in the world when they were installed in 1889, and are still useful as stand-by plant. Enormous steam alternators of 10,000 H.P. each were designed by Dr. Ferranti, and partly constructed, but were never erected; we recollect seeing the shaft of one of these sets in Messrs. Beardmore's Parkhead works at the time—it was 3 ft. in diameter, and the revolving armatures were to have been 46 ft. in diameter, the whole alternator weighing 500 tons. The old plant is still in working order at Deptford, but the bulk of the plant consists of modern turbo-generators, to which we shall refer later.

One of the most interesting features of the station is the original 10,000-volt switchboard, which is still used in conjunction with the single-phase generators; the switches are of the air-break type, with arms 6 ft. in length, actuated by levers of the railway signal-cabin type, and giving a break of 54 in. The stationary contacts are mounted on insulators fixed to the wall, as shown in the accompanying illustration. These switches were originally intended to be used in conjunction with oil-break switches, connected across the lower contacts, and tripped by the same movement as, but later than, the air-break switches, so as to extinguish the arc formed by the latter; but the air-break was found effective without assistance, and the oil-break switches were dispensed with. It is interesting to note that the design of the oil-switches, which was got out in 1895, is essentially the same as that of the standard switches of to-day; oil-switches have been in use on the company's circuits since 1892, and the whole of these early types of air-break and oil-break switchgear were designed by Mr. G. W. Partridge, chief engineer to the corporation.

The original Ferranti tubular paper-insulated mains from Deptford to London are also still in continuous use; they are controlled by modern 10,000-volt oil-switches, as seen in the foreground of fig. 1, and are brought into action with the aid of main-charging apparatus, which has been in use since 1894, for the design of which also Mr. Partridge was responsible.

The station supplies consumers on four distinct systems:—The original 85-cycle, 10,000-volt single-phase system; D.C. three-wire for local power and lighting at 460 and 230 volts; 25-cycle, 6,600 volts three-phase for power and traction; and 25-cycle, 6,600 volts single-phase for the L.B. & S.C. Railway. These supplies are respectively linked together with a 2,000-H.P. British Westinghouse frequency changer, and a rotary converter, while the 25-cycle plant can be used for generating either single-phase or three-phase.

The generating plant comprises six single-phase 10,000-volt, 85-cycle Ferranti and B.T.H. alternators, driven by vertical reciprocating steam engines; four 2,500-KW. Dick, Kerr engine-alternators; two turbo-generators giving either single-phase or three-phase current at 25 cycles, and rated at 7,500 KW. each, but capable of taking an overload of 50 per cent. for half an hour; one 15,000-KW. tandem turbo-generator giving single or three-phase current at 25 cycles; and one 3,000-K.V.A. turbo-generator giving single-phase current at 85 cycles, 2,400 volts, which is stepped up to 10,000 volts. The last-named machine is controlled entirely from the old wooden switchboard, with modern instruments; it consists of an Oerlikon turbine coupled to an Oerlikon single-phase alternator, running at 2,500 R.P.M.

The two 7,500-KW. sets have Parsons impulse-reaction

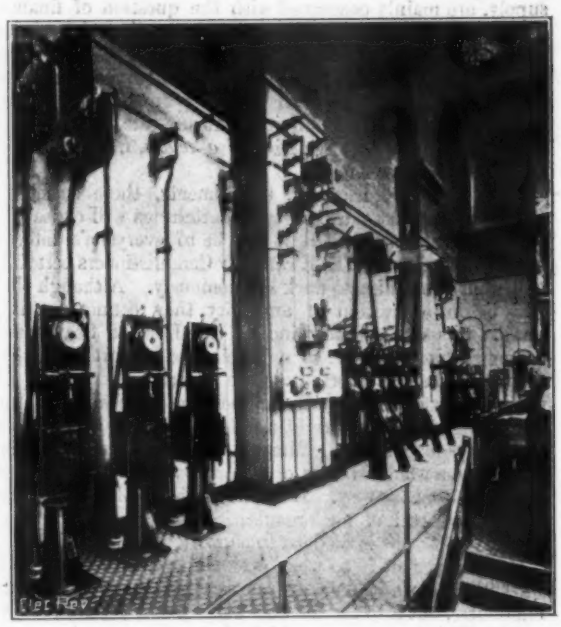

Fig. 1.—Single-Phase, 10,000-Volt Switchgear, in Use from 1895 to Date.

turbines and Brown-Boveri generators, and were installed to cope with the railway and three-phase power load; they are consequently of very substantial and special construction, in view of the heavy overloads which frequently occur. They are provided with duplicate Heenan & Froude wet air filters, and discharge the air into a large trunk which opens outside the building.

The set most recently installed consists of a Richardsons-Westgarth turbine coupled to two Brown-Boveri generators in tandem; one is a 7,500-KW. single-phase alternator, the other a 12,000-KW. three-phase machine designed to give about 8,000 KW. single-phase, and the turbine is capable of working continuously at 15,000 KW. if required. The set runs at 1,500 R.P.M. and generates at 7,000 volts. The single-phase machine is provided with a Sturtevant wet-air filter, while, unlike the other filters, is outside the building, while the hot air is discharged inside the turbine room. It was found that the filter was apt to freeze, while the very cold air chilled the generator frame and induced sweating inside it; these troubles were successfully overcome by directing a portion of the hot air discharged from the

alternator into the filter by means of the cowl which will be seen in the accompanying illustration. The other machine draws air through a canvas filter for the present, but will eventually be provided with a wet air filter. The set has proved highly satisfactory, running day and night under wide variations of load, and is only stopped once a fortnight for inspection. At the time of our visit the vacuum was 97 per cent. of the absolute maximum, although it was in July. Reactance coils rated at 5 per cent. are included in circuit with the alternators on railway load: they are of the iron-cored type.

The main B.T.H. switchboard for traction and power load, shown inone of our views, is in great part new, its predecessor having been blown to bits by a 250-lb. Zeppelin bomb, which fell on the switchboard gallery in front of it; the switchgear and connections were annihilated, and the attendant, who was badly wounded, died in hospital. The whole of one side of the engine-room, consisting of corrugated iron, was blown out, and the glazed roof was

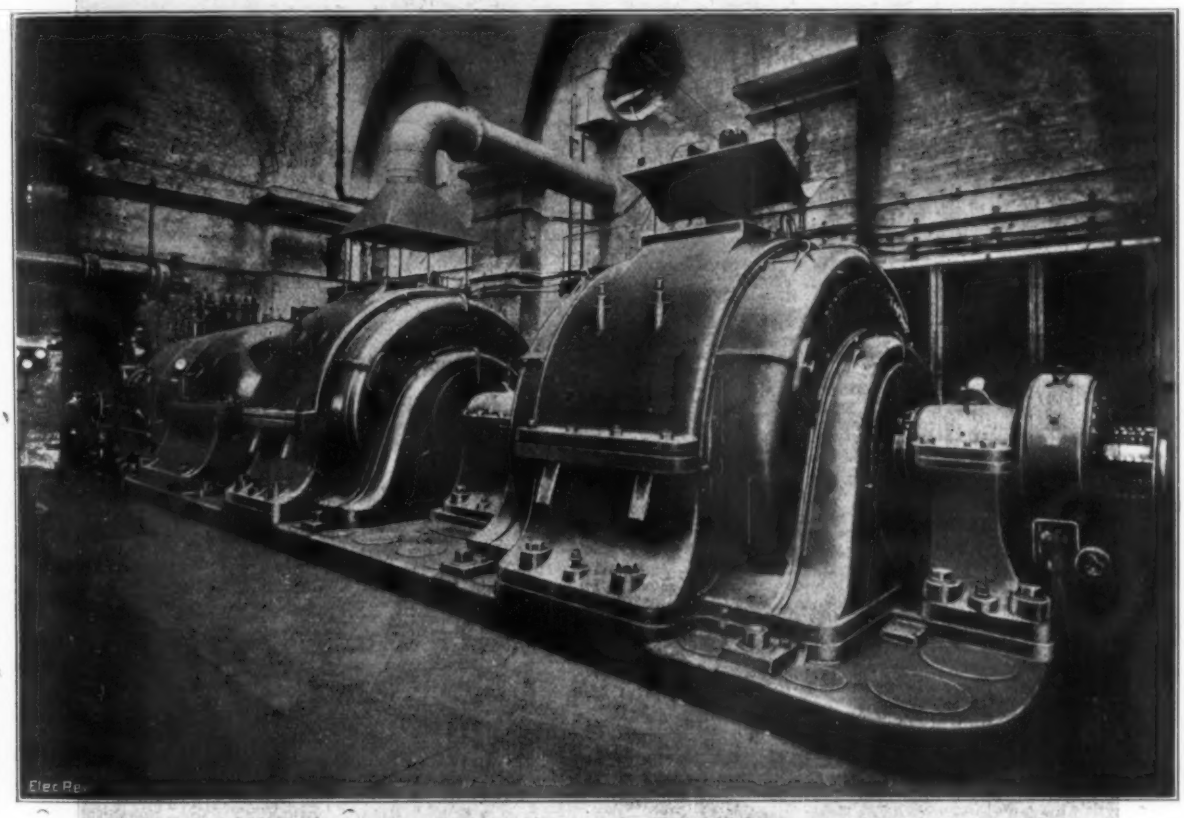

Fig. 2.—Tandem 15,000-kw. Turbo-Generator by Richardsons-Westgarth and Brown-Boveri.

destroyed. Fortunately no steam pipes were broken, though some of the generators were damaged by splinters. The bomb fell at 1.38 a.m., and left chaos on the gallery; but in three hours the d.c. load was restored, in six hours the three-phase supply was resumed, and in 18 hours supply was given to the railway—a remarkable feat, considering the conditions at the power station. Many evidences remain of the effects of the explosion, but none more singular than the mysterious passage of a bundle of papers through a matchboard partition. The bundle was hanging on a nail inside the station engineer's office; to-day it is still there, hanging on the same nail, but the string passes through the partition, and the packet is *outside* the office! A crack is visible in the woodwork, and it appears that the boards were momentarily bulged inwards, the papers being sucked through the gap by a back-draught before the opening had time to close. Yet none of the glazing of the office was broken, and the partition needed no repairs. To preserve this extraordinary freak, a glass case has been fitted over the packet of papers.

The switchboard controls four 2,500-kw. engine alternators, two 7,500-kw. turbo-alternators, and one 15,000-kw. turbo-alternator, besides four single-phase traction feeders and five three-phase power feeders. Any set can be used on either class of supply. The earlier part of the board has bare copper bus-bars and cellular switchgear, but the newer section, controlling the turbo-generators, is divided into four galleries, the oil switches and group switches for the generators being mounted above the operating gallery, and the feeder switches below. The main bus-bars, fixed to the wall behind the board, consist of single lead-covered cable, and the oil-immersed isolating switches are similarly enclosed in an earthed metallic casing, so that no live conductor can be touched, and no cleaning is required. The isolating switches for the railway and power bus-bars are interlocked, so that a machine cannot be on both supplies at once, and the synchronising gear is similarly interlocked, so that a machine can be synchronised only with the set of bus-bars to which it is about to be connected. The isolating switches are padlocked, and the keys of the padlocks are placed under the buttons controlling the main switches, so that they cannot be got without first switching off the corresponding generator, thus preventing the isolating switches from being opened under current. Pilot lamps on the boards enable the attendants to see the exact position of the isolating switches, and these lamps only light up when all three belonging to one set are "on" or "off." Hence a mistake is almost impossible.

In view of the heavy short-circuits that sometimes occur on the railway, the main switches are of very heavy construction; they are motor-driven, with remote control, and are capable of breaking 150,000 kw. They have been tested by switching one of the 7,500-kw. generators on a dead short-circuit, and switching it off again.

The reactance coils used in circuit with the 12,000-kw. set weigh 15 tons.

Both the 85-cycle and the two 25-cycle systems are controlled by Tirrill regulators, which give great satisfaction, in spite of the wide fluctuations of power factor and load on the power and traction supplies.

The generators on the 3-phase load were orginally run with one phase earthed and one of the other two to line; the latter only, therefore, were provided with oil-switches, the earthed

phase being constantly connected to the generators. The corporation, however, was called upon to supply power to the L.C.C. tramways, for which purpose the earth connection was, of course, unsuitable. Consequently the bus-bars are now tied to earth by star-connected transformers, with the neutral point of the latter earthed through a resistance.

The railway supply, on the other hand, is earthed on one pole, at the railway only; an automatic switch is provided at the power station, which, if the potential of the earthed bus-bar rises to 1,000 volts above earth potential, puts the bar to earth at the station and sounds an alarm bell. The railway load averages about 8,500 KW.

At times of light load both single-phase for the railway and three-phase for power supply are taken off the same generators; no trouble results from the out-of-balance.

The boiler house contains five batteries of six Babcock and Wilcox boilers, each rated at 25,000 lb. of steam per hour, and one battery of boilers rated at 10,000 lb. All have economisers and integral superheaters except one battery, which is provided with a separately fired Sterling superheater. The Boby feed-water heaters are heated with exhaust steam from the auxiliaries. Make-up water is obtained from the town mains with 12° of hardness, and all the feed goes through one boiler only, where the hardness is removed. The fuel used under war-time conditions was, of course, of very inferior quality, one-third of it being incombustible, and as many different varieties were used, difficulty was met with in regulating the depth of fire to suit the fuel; this was completely overcome by adopting a movable dumping-bar, of which particulars were given in the ELECTRICAL REVIEW of April 26th, 1918. This bar can be set at any height to suit the kind of fuel in use, and if an accumulation of clinker occurs, it can be lowered to discharge the clinker, and then restored to the original height. Sections of the bar in the highest and lowest positions are given herewith.

Coal is delivered by 200-ton barges, from which it is taken by grab cranes and dropped into hoppers; after weighing, the coal is taken by Temperley transporters, erected by Messrs. Arrol, to the bunkers over the boiler house. One of the transporters is 380 ft. long; the other is in course of erection. A large quantity of coal is stored in the open, and a railway siding provides an alternative method of delivery.

Circulating water is derived from the River Thames by four centrifugal pumps, two of which, by Drysdale and Gwynne, can deliver 1,000,000 gallons each per hour, and two by Messrs. Bumsted & Chandler, of half that duty. One is driven by steam, the rest by motors. Each has a separate suction pipe, fitted with a revolving patent strainer manufactured by the corporation; the strainer is a perforated gun-metal cylinder to the periphery of which adjustable scrapers are applied. The solid matter removed by the scrapers falls into a hopper, which is periodically flushed, returning the *débris* to the river. These strainers have been at work for nine years with satisfactory results, and have also been adopted at many other power stations.

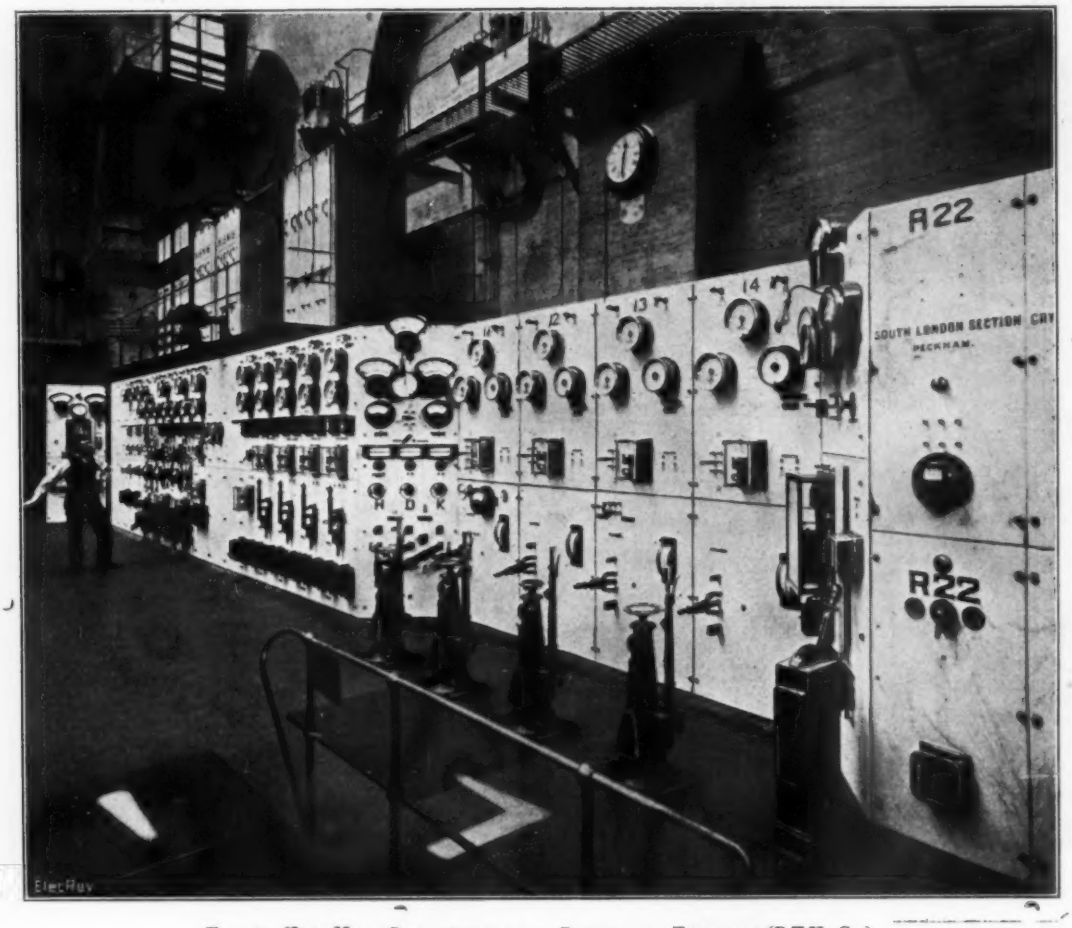

FIG. 3.—NEW MAIN SWITCHBOARD FOR POWER AND TRACTION (B.T.H. CO.).

Full provision is made in a well-equipped laboratory for analysing and testing fuel and flue gases, and for testing oil for turbines; for the latter purpose an apparatus is employed which, by agitation and oxidisation, heating, &c.,

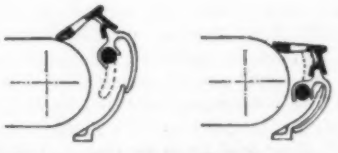

FIG. 4.—ADJUSTABLE DUMPING-BAR.

produces practically the same effect on the oil in a week as would result from six months' use in a turbine, and consequently prevents heavy loss due to the use of unsuitable oil.

Large drawing offices and workshops are provided, which are capable of dealing with the heaviest repairs, and also undertake new work on a comparatively large scale.

We have to thank Mr. Partridge for a very entertaining and instructive visit, and his staff—Messrs. Feetham (station superintendent), Ellis (electrical engineer), and Fox (boiler house superintendent) for their courteous assistance in the preparation of these notes.

THE ELECTRICITY SUPPLY BILL.

(*Continued from page* 6.)

The Association of Municipal Corporations has issued a judicial and moderately worded report on the Bill. Whilst supporting generally the policy of other municipal bodies, the Association suggests that in areas where the circumstances offer no prospect of benefit from inclusion within the jurisdiction of a District Board, the local authorities should be given the powers of a Board. It holds that the principle of compulsory purchase should apply universally, and that small isolated undertakings should not be exempt from purchase unless they consent to exemption. The usual objection to the purchase clause is stated, and strong opposition is offered to the clause enabling a District Board to transfer or lease its undertaking to a company. Remuneration of members of District Boards, in the opinion of the Association, should be confined to the chairman, and the powers of control over the District Boards with which the Commissioners are armed are held to be excessive. Other objections relate to the general powers of supply granted to the District Boards, on the score of competition with authorised distributors, and to the drastic powers given to the Commissioners in the interim between the passing of the Bill and the establishment of a District Board.

A deputation representing North-East Coast municipalities was recently received by the Home Secretary and the Electricity Sub-Committee of the Commercial Committee of the House of Commons. The chief contentions of the deputation were that the bureaucratic and departmental tendencies of the Bill should be modified; that local authorities should be fully represented on the District Boards, and the majority of the members should represent public interests; that the powers of a Board should not in any case be leased to a company; and that the terms of purchase should be as favourable to local authorities as to companies—not as drafted in the Bill.

The Association of British Chambers of Commerce last week resolved that the time had not arrived for framing a complete scheme such as was contemplated in the Bill, and that the proposed Commission should for the present be confined to investigation with a view to the formulation of a scheme.

The Association of Municipal Corporations has adopted a report of the Law Committee on the Bill, which states that in determining the constitution and powers of the District Boards great care will have to be taken to ensure that the interests of those Corporations that are authorised undertakers, and of the inhabitants of their cities and boroughs, are not prejudiced; provision should be made for securing a substantial majority on each Board of Representatives of the local authorities affected. Where the supply is given by a local authority, and no improvement would be likely to result from including the area within the jurisdiction of a District Board, it is suggested that areas of this character, with the addition thereto of such neighbouring areas as can conveniently be supplied in conjunction with them, should be excluded from the provisions relating to the establishment of such Boards, and that local authorities themselves should be given the powers of a Board, including the monopoly in the generation of electricity. A generating station that could not conveniently be used for the purposes of a District Board should be exempted from acquisition only where the owners of the generating station in question consent. The terms upon which existing generating stations are to be acquired by the District Boards are open to objection; the clause should provide for the payment of the actual value of the station in every case, but if this is not conceded, local authorities should at least be placed in as good a position as the companies, and be entitled to be paid the cost of the station less depreciation.

Strong objection is taken to the proposal contained in Clause 16 of the Bill enabling District Boards to exercise their functions through a company established for the purpose, or to lease their undertaking to a company. District Boards are to be public bodies, and to a large extent to supersede the local authorities, and in the opinion of the Association it would be entirely contrary to the principle of the Bill that their functions should be transferred to a company, whose primary object would be to make a profit for its shareholders.

It should be made clear in all cases that the loans raised by the Boards will have the support of Government guarantee. Unless that is done the Boards will probably have considerable difficulty in raising their loans, and will, no doubt, have to pay a high rate of interest.

With regard to the proposal to remunerate the members of the Board, it is suggested that the chairman only should be paid. Objection is taken to the wide powers of control over District Boards proposed to be given to the Electricity Commissioners.

Objection is also raised to the provision that the District Boards may give a supply in the areas of authorised distributors, as the practical effect would be that the District Boards would be enabled to compete with the authorised distributors if they were able to supply electricity at a lower price. It is suggested that the limit of five years for the payment of compensation for loss of employment should be omitted. Strong objection is raised to the grant of compulsory powers of control, of a somewhat drastic character, to the Electricity Commissioners for exercise during the period between the passing of the Bill and the establishment of a District Board.

The provisions relating to the audit of accounts are criticised, and the transfer of the powers of the Board of Trade to the Ministry of Ways and Communications is objected to.

An Intelligent Anticipation.

A Provisional Committee to prepare a scheme for submission to the District Board for the Furness and South Cumberland areas, when constituted under the Bill, was formed at Barrow on Tuesday last week, at a conference of representatives of local authorities; Mr. H. R. Burnett, A.M.I.E.E., electrical engineer to the Barrow Corporation, gave an interesting *résumé* of the Bill. He said that, unfortunately, there was no prospect of greatly cheapening the supply in the near future, but the reorganisation of the supply which would follow the passing of the Bill would, if the District Boards carried out their duties effectively, result at an early date in a supply being commenced in many districts where at present there was none available. It was decided to form a committee of representatives of the Barrow Corporation, Millom, Ulverston, Dalton, and Grange Urban District Councils, Ulverston Rural District Council, and Bootle Union, Messrs. Vickers, Ltd., Barrow Hæmatite Steel Co., the Furness Railway Co., Millom and Askam Hæmatite Iron Co., North Lonsdale Iron and Steel Co., one representative of iron ore mine owners, one of the Windermere and District Electricity Supply Co., and one representative of Labour.

Mr. Burnett was warmly thanked for his services, and asked to act as secretary to the Provisional Committee.

(*To be continued.*)

Large Turbo-Generators.—The two vertical-shaft water turbine generators which were ordered in February of this year by the Ontario Hydro-electric Commission, for the new Queenstown station, will be, according to the *Engineer*, the largest water-wheel units in the world. Each is rated at 45,000 K.V.A., 80 per cent. power factor, 12,000 volts, three-phase, 25 cycles, and will operate at 187.5 R.P.M., and is capable of delivering the full output of the turbine, namely, 52,500 H.P. The approximate total weight of one generator with its direct connected exciter is slightly over 1,900,000 lb. At the top of the generator frame, a thrust bearing of Kingsbury type will be placed to carry the entire weight of the generator and turbine rotating parts. This bearing is guaranteed to operate under a total load of 900,000 lb. The exciter will be direct connected with the generator shaft, and mounted above the thrust bearing. The overall diameter of the generator is about 25 ft., while the height above the base ring is approximately 25 ft. 7 in. to the top of the exciter. Each of these generators will require about 115,000 cu. ft. of air per minute for cooling purposes. The specifications require that several temperature detectors be placed at various positions in the winding slots and that they be connected to a measuring instrument, so that the temperatures may be ascertained at any time. The generator is guaranteed to operate at the rated load with an observable temperature, by thermo-couple measurement, not exceeding 105 deg. C., with an air temperature of 40 deg. C. The armature windings will be subjected to a one-minute insulation test, after the machine is assembled, at 30,000 volts to earth and between phases. The generator is guaranteed to stand a short circuit without injury, and will be designed safely to withstand a runaway speed of 347 R.P.M. Owing to the large dimensions of these machines, they will have to be assembled in the generating station. It is expected that both of them will be in operation early in 1921.

DOMESTIC ELECTRIC APPLIANCES.

The articles which we published on this subject in our issue of June 20th attracted a good deal of attention, and have elicited information showing that our contention that there was a large potential demand for electrical domestic labour-saving appliances was fully justified. If the goods can be placed on the market, they will have a ready sale; they will provide the central-station engineer with a useful load, which will benefit his load-factor, and their manufacture will provide employment for British labour and capital, while they will be a boon to the over-burdened house-wife.

We were pleased to learn from the Glasgow Corporation Electricity Department that a large consignment of electric clothes-washing machines is now on the way to this country. Mr. R. Hardie, show-room manager, informs us that a sample machine was exhibited in one of the show-windows for a week, and led to good business; a number of these machines had been sold by the department three years ago, before the import restrictions for appliances of this class came into force, and Mr. Hardie is confident that the clothes-washing machine will become a staple line like the suction cleaner. About a hundred of the latter were sold in a couple of months, as the result of a working demonstration in a large show-window. The only regrettable feature of the business is that the labour-saving appliances to which we drew attention are not yet made in this country; there is no reason, however, why our manufacturers should not make them. The interest excited by the exhibition of the electric washer is indicated by the accompanying views of the show-window of the Glasgow Corporation Electricity Department, which, incidentally, may give some useful hints to the managers of other show-rooms.

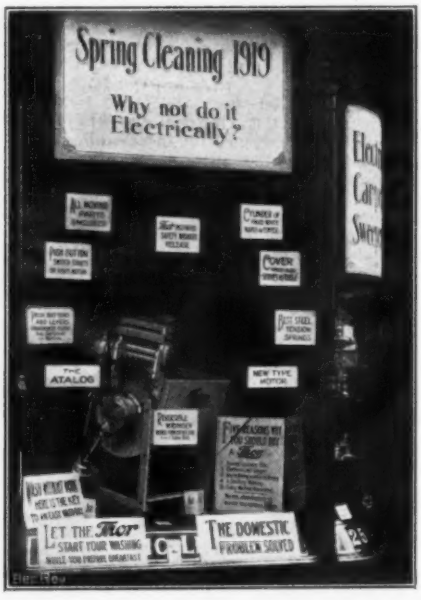

Fig. 1.—Electric Washer in Show-window.

Fig. 2.—Public interest in the Washer.

In our issue of May 30th we drew attention to the electric house exhibited at the Royal Agricultural Show, Cardiff, by the South Wales Electrical Power Distribution Co. We learn from Mr. C. T. Allan, assistant manager to the company, that "the exhibit of domestic labour-saving appliances at Electra House was a great success. Over 13,000 people passed through it in the five days of the show, but this number could have been more than trebled if it had not been necessary to admit the visitors in parties so that they could properly view the exhibits. The visitors were far from being local; they came from all parts of the British Isles, from the Colonies, from India, from the United States, and from South America and other parts of the world. Electra House was also honoured by a visit from H.R.H. the Prince of Wales, who was greatly interested in what he saw, questioning the staff on the various types of apparatus. The Lord Mayor of Cardiff, and many other well-known people, visited Electra House. Most of the visitors were greatly surprised and appreciative of the number of labour-saving appliances that were to be seen. Visitors from overseas took especial interest, and many promised to write when they returned home for help to procure them.

"Many complimentary references were made in the local Press, and one heard in passing among the crowd 'Electra House' named as a rendezvous, as well as expressions of disappointment from many who were unable to gain admission, although they had tried as often as four times in one day and five in another.

"Confirmation from all quarters proclaimed that Electra House, the pioneer Electrical Exhibit at the R.A. Show, was an unqualified success; in fact, the staff had more than one genuine offer to buy the house and its contents as it stood. Hopes were expressed on all sides that it would continue to be a feature of future shows.

"The Committee and staff of the Exhibit gained a good deal of experience and useful information, which they will be most pleased to hand to other promoters of similar exhibits. They hope to be able to prepare an illustrated pamphlet describing this, and will be most pleased to send a copy to anyone who feels interested."

The result of this venture has obviously been most satisfactory. In our issue of June 20th we advocated the holding of an Exhibition in London devoted wholly to the actual demonstration of domestic labour-saving and fuel-saving devices, and, in view of the success of the Cardiff show, we are more than ever convinced that that is a sound and profitable policy. In some London show-rooms already a variety of such apparatus is exhibited, but the point is that the demonstration should not take place in a shop or show room—it should be an "Electric Home," devoted entirely to the purpose of illustrating the limitless possibilities of electricity in the household.

We are pleased to be able to add that private enterprise is already busy on these very lines, and in a month or two an exceptionally complete and admirably conceived model household will be opened in London, preparations for which were in progress, unknown to us, long before we mooted the proposal. But for the present no more can be said with regard to this particular project.

One of the most interesting features of "Electra House," at Cardiff, was the "Hobart Kitchen Aid," which we illustrate herewith. This remarkable device is a sort of electrical "Admirable Crichton"; it is intended for the domestic kitchen, and will knead dough for bread and pastry, whip cream, beat eggs, peel and mash potatoes, grind coffee, slice vegetables, make sausages, shred suet, chop dates,

Fig. 3.—Hobart Electric Kitchen Aid.

freeze ices, mix cakes and puddings, and, indeed, do almost anything that is required in the way of preparing food. It weighs about 145 lb. packed, and stands 27 in. high; it is provided with three speeds, and can be run off an ordinary lamp socket. This goes a long way towards filling the want for a universal electric household appliance. It is, of course, accompanied by a variety of attachments. We understand that during the exhibition, orders were placed for no fewer than 6,000 of these handy electric servants.

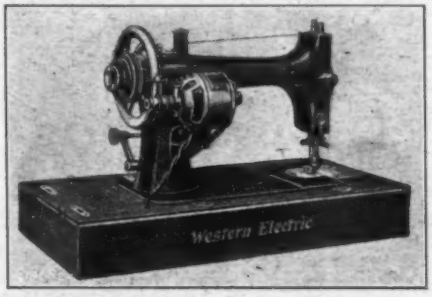

Fig. 4.—Electric Sewing Machine.

The electric sewing machine is an article which is likely to be as much in demand as any other household appliance, and we show in fig. 4 an example in which the motor is mounted on the frame of the machine, driving the fly-wheel by a friction pulley. A very small motor here saves a great deal of labour and time, and immensely lightens the burdens of the house-wife.

French Water Power.—The *Echo de Paris* recently stated that the necessity of purchasing foreign coal might be relieved by developing the water power of France, which is estimated at 10,000,000 H.P., as compared with 7,000,000 H.P. for Norway, and 6,000,000 H.P. for Sweden. Before the war only about 750,000 H.P. was used, but a further 450,000 H.P. was developed during the war, and by the end of 1921 1,600,000 H.P., or 16 per cent., of France's resources will be worked. This leaves a huge amount of water power in reserve, and, in addition, there are large potential resources in the rivers of Indo-China and French West Africa. One million water H.P. would lessen the consumption of coal for power production by at least 3½ million tons, costing about 300 million fr., and the comparison is the more striking when it is remembered that a hydro-electric installation has eight times the average efficiency of steam engines.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Cost of Living in India.

Would you kindly, through the medium of your valuable paper, allow me to offer a word of advice to electrical engineers who are contemplating going to India to take up positions there? I am home from that country after a stay of seven years, and therefore can speak from experience. I have recently seen advertisements for men from rupees 280 *per mensem* and other low offers combined with a four or five years' agreement, which means that a man comes home worse off in all respects than when he went out. In Calcutta, for instance, it would cost a single man at least 160 rupees a month for board, and perhaps 200 rupees for clothes, servants, amusements, &c., as everything is just about as dear as it can be. No engineer should consider any job under 500 rupees a month, plus quarters, which should be furnished and free from tax; if he does he is seeking trouble, as I can assure him that India, and especially Bengal, is not a place to go for one's health, for what with the heat (105 degrees in Calcutta during June), mosquitoes, malaria and other choice tropical diseases, native labour, &c., one gets fed up with being fed up. All the worries of India are bearable, however, if one feels one is improving one's financial position, and therefore for anyone to accept a lower wage than Rs. 500 is courting disaster and misery for himself and family (if any). This wage should be progressive. I should be pleased to see anyone who is proceeding to India for the first time if the Editors would kindly put him in communication with me. I enclose card.

Chief Engineer.

London, *July 4th*, 1919.

[Our correspondent's statements agree with particulars which we have received from other sources. Information of this kind is exceedingly useful, and we shall be glad to hear from other readers who are in a position to state the cost of living, &c., in any foreign country or in the British Dominions and Colonies.—Eds. Elec. Rev.]

Rats and a Fire Call.

On several occasions the Electrical Review has recorded curious faults with consequent damages or inconvenience caused by rats gnawing through live circuit insulation, resulting in an earth or short on the system, and fortunately in some cases sudden death to the rodents themselves.

It is believed, however, that this is the first instance where a rat is held responsible for calling out a fire brigade; it happened at Ealing at 11 p.m. on June 26th, when the brigade turned out, only to find on reaching "the point" some two miles distant that it was a false alarm. The circuit was then promptly disconnected, and the following day a close inspection was made of the street cable system, with the result that at one of the manholes the lead sheathing of the cable was found to have been half eaten away at a joint.

As the system is operated by a central battery with earth return, it is believed the culprit, whilst gnawing at the lead, caused an intermittent short to earth, which resembled a real fire call and so misled the brigade.

C. A. Smith.

Ealing, *July 5th*, 1919.

Tariffs on Imported Manufactured Goods.

In reply to Mr. Greenhalgh's letter in your July 4th issue, I feel that it is more than probable that if there had been no war the manufacturer's statement he refers to would by now have become true.

I think the fact that we have had protection for three or four years now has probably been one reason why the firm in question has been able to survive and has been increased many-fold.

The next point mentioned is quantity production. I have the feeling that the recent American combination of electric heating and cooking manufacturers will very soon put them in a similar position in the electric heating and cooking industry, as the writer mentions Henry Ford occupies in the motor industry.

I cannot say from actual experience that there are no manufacturers of about my scale existing in America. I consider they might exist there, their home market being protected and prices kept at a fair figure. It is, however, obvious that the small manufacturer in America has a greater chance of success than the small manufacturer here, because he has only the home competition to contend with, and this is fair competition. I have never complained, and never shall, of home competition; it is not only unobjectionable, but necessary to secure best all-round results. Free import of manufactured goods from protected countries is not fair competition.

I cannot see any basis in the argument that if they are able to exist there they can do so here, the fiscal condition of the two countries being absolutely different.

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I cannot see how an English manufacturer making, say, 200 articles a week, can compete with an American manufacturer turning out 6,000 articles per week. (This happens to be about the position of one article I know of.)

In this country under free trade a manufacturer is always open to the competition of "dumped" goods. Hence he has no confidence in starting seriously.

Mr. Greenhalgh admits the progress of America, Germany and Japan, but suggests this is due perhaps more to the "deeper cultivation of scientific research and method" than anything else.

In fairness I think one can be permitted to assume that in countries where they bring such brain power and concentration to bear on manufacturing and methods generally, they would not overlook going very thoroughly into their "fiscal" policy also, and as they have high tariffs on manufactured goods it seems obvious they consider them essential.

If tariffs are considered essential by the most scientific countries, why are they not essential for us?

However, I quite agree that deeper scientific research must be of advantage; but this does not combat my argument that it is impossible (even if we took advantage of such imputed foreign superiority of brain power by exactly duplicating their very best and latest appliances and the method of production) for us to manufacture them as cheaply as they could owing to their larger market.

From what I have read about Austria, that country was progressing rapidly just before war, having secured apparently the bulk of our glass, pencil, carbon and pottery trade, and getting other industries started.

France is perhaps a more agricultural country than manufacturing, neither had they what can be called scientifically applied tariffs. Moreover, minerals, such as coal and iron, were always more or less scarce in France, and had it not been for their tariffs, their manufacturing position just before the war would no doubt have been far worse than it was.

I am quite willing to substitute "generally" instead of "invariably" if this helps any, but everybody knows the actual facts.

If discouragement of imports of products of sweated labour is a protectionist plank, presumably it applies to all protectionist countries, yet one does not see America and Germany, for instance, refusing our raw materials, coal, iron, partly finished wool and cotton goods in exchange for their highly finished, high wage paying appliances which they send over to us.

That coal, iron, cotton and similar industries were "sweated" ones is obvious from the conditions of living in the districts where they are worked, and from the fact that the recent strikes in these industries were for a "living wage."

The following abstracts from a letter of the *Morning Post* of June 24th, 1919, are interesting:—

(1) Great Britain has a far larger percentage of "parasites" to its population than any other country in the world.

(2) Great Britain has the largest and worst slum areas in proportion to its population of any country in the world.

(3) Great Britain, though its soil and climate are favourable to agriculture, produces less of necessary foods for its population than any other country in the world.

Dealing with the last paragraph, it must be left to everyone individually to decide whether in their own minds this country was progressing or getting knocked out in, say, the four or five years prior to the war. (Witness the dye industry, the lace industry, electrical industry, and the many others before mentioned). One fact was that under normal conditions, just prior to the war, our imports were rapidly getting larger and larger than our exports, which it is generally admitted cannot go on *ad infinitum*.

Even Mr. Greenhalgh can hardly say in the face of this fact that we are a progressive manufacturing nation.

The success of a nation depends largely on the success of its individuals. Unless some change is made in our fiscal policy I for one shall be compelled to close down the expansion of my business in certain directions which I had in view, and which would have employed a few of those now out of work. There are probably many thousands of other small employers in the same position.

Unfortunately Mr. Greenhalgh's letter does not prove me wrong in any of the reasonings which I put forward as to why I feel I cannot compete with unrestricted foreign imports, and why I have not sufficient confidence under present conditions to start a new large works for the manufacture f electrical heating and cooking appliances in this country, which otherwise and under fair trade conditions I certainly would.

Finally, as Mr. Greenhalgh is of opinion that the solution lies neither in Protection nor Free Trade, can he on the other hand suggest what is the solution to the graver perils to which he refers?

Can he put forward any arguments or reasonings sufficiently strong and practical to enable, as an instance, just me personally, to gain sufficient confidence to launch out in a big development of the highly finished nickel-plated electric heating and cooking appliances for table and general domestic use?

I want to do it, but under present conditions, it seems to me, for the reasons I gave in the article, that I should most probably lose my money.

C. P. Belling.

Upper Edmonton, *July 5th*, 1919.

BUSINESS NOTES.

To Our Readers and Advertisers.—For the information of those who may not already be aware of the fact, we wish to state that notices appearing in our editorial pages are not inserted in return for payment in any shape or form. Some of our correspondents appear to be carried away with the idea that the war has "changed everything," but the revolution has not altered our principles one iota regarding the absolute necessity for the completest possible independence in regard to editorial contents. If a piece of information commends itself as being of interest to the electrical trade we insert it as news. We quite recognise that there is a news value in advertising and sometimes an advertising value in news. But there is an important difference in that the advertiser may, up to a certain point, say what he likes regarding himself and his doings, while in the editorial pages the editors say just what they like, and no more and no less. This may sound somewhat autocratic, but the wiles of the devil are not unfamiliar to us after all these years, and for editors who are jealous of their reputation and wish strictly to preserve their independence, a coat of mail is as necessary as a mailed fist.

Crypto River Party.—On Saturday last, a party from the Crypto Electrical Co., Ltd., spent an enjoyable day on the river. At 10 a.m. a start was made from Richmond on the steam launch *King*. Luncheon and tea were served on board. Staines was reached at about 4 p.m. Music and good humour compensated for adverse weather conditions. The party included Mr. T. E. Goodyear (chairman) and Messrs. J. G. and C. R. Shaw (governing directors). Arrangements were carried out by the Canteen Committee.

Government Property Sales.—No. 3 (July 1st) of *Surplus*, the official organ of the Surplus Government Property Disposal Board contains 90 odd pages of matter setting forth a vast quantity of Government property that is offered for sale. There are sections relating to plant and machinery, mechanical transport, railway material, dock and wharf equipment, electrical stores and instruments, ferrous metals, chemicals, and so forth. The paper is issued twice a month, and copies may be obtained at all bookstalls and newsagents, at 3d.

Lead.—In their weekly letter, dated July 5th, Messrs. G. Cawson & Co. say:—

"Consumption for building purposes remains extremely slack, but electrical works continue to take lead rather freely; this seems to be the only redeeming feature in the market."

Dissolutions and Liquidations.—Oulton Broad Electricity Co., Ltd.—Winding up voluntarily. Liquidator, Mr. A. Garratt, Suffolk Chambers, Lowestoft. Meeting of creditors to-day at Lowestoft. The undertaking is being sold to the Corporation.

Birmingham Lighting Co, electric light, gas, and oil lamp fittings makers, 133, Conybere Street, Birmingham.—Messrs. H. J. Rooke, W. Bennett, and H. V. Woolcock, have dissolved partnership.

Consolidated Diesel Engine Manufacturers, Ltd.—Second dividend of 5s. payable July 7th, at Aldwych, W.C.

Lee & Walker, electrical engineers, Ormskirk and Liverpool.—Mr. J. R. Lee and T. R. Walker have dissolved partnership. Mr. T. R. Walker will attend to debts.

Connolly Bros., Ltd., Vale Mills, Blackley, Manchester.—Petition for winding-up presented June 16th, order made July 1st.

Portable Electric Motors, Ltd.—Meeting called for August 9th at 12, Lime Street, London, E.C., to hear an account of the winding up from the liquidator, Mr. A. F. Newton.

Radium, Ltd.—First and final dividend, 4s. 11$\frac{3}{4}$d. per share.

Trade Announcements.—The business of the firm of Halliwell & Co., Ltd., of Manchester, now in liquidation, will be carried on in future under the title of Halliwell & Good, at 61, High Street, Manchester, and the firm desire to receive manufacturers' catalogues and lists of electrical supplies.

The Sloan Electrical Co., Ltd., have, owing to extending business, taken additional premises at 8 and 10, Golden Lane, London, E.C., next door to their present address.

Messrs. D. Hulett & Co., Ltd., of 55 and 56, High Holborn, London, W.C.1, have decided to discontinue business, and on July 9th and following days, have been disposing of their stock by auction.

Mr. Wm. Sharps has commenced business as an electrical engineer, at 62, South Street, Yeovil.

Mr. Douglas Adams has commenced wholesale and retail electrical business, also installation and repair work, at 38A, Smithford Street, Coventry. Catalogues and particulars of prices are desired.

Messrs. Lindsay & Ward, 90, Pilgrim Street, Newcastle-on-Tyne, have been appointed agents for the N.-E. Coast district for Messrs. Frank Pearn & Co., Ltd., Manchester.

Messrs. R. B. Hand, Ltd., of 63, High Holborn, London, W.C., are a new company which has as its head Mr. R. B. Hand, formerly with Messrs Scholey & Co., Ltd., and until recently manager of the electrical department of Messrs. Thacker, Bell & Co. The firm will specialise as electrical and mechanical engineers and factors. Among the firm's representations are James Tate, Bradford, for motors and generators, and the Evinrude Motor Co. for oil engines.

The Trans-Atlantic Electrical Co. have commenced business at 890, High Road, Tottenham, N. 17. The partners, Messrs. W. E. Dines and J. Aggio, are specialists in kinema work, in addition to the usual contracting business.

Catalogues and Lists.—Messrs. Higgs Bros., Sand Pits, Birmingham.—July stock list of shunt-wound interpole motors from 4 to 45 h.p.

Messrs. Welco Patents, 150, Alma Street, Birmingham.—Illustrated leaflets giving prices of Grimmitt's "Sure Fics" fixings for electrical work; also of the "Welco" combined electric fire and cooking stove.

Messrs Automatic and Electric Furnaces, Ltd., 281-283, Gray's Inn Road, London, W.C. 1.—Circular describing the magnetic sclerometer for measuring the hardness of ferrous metals; also Heat Treatment Bulletin No. 12, on "The Location of Hardening-shop Faults," Part II, by F. C. A. H. Lantsberry.

General Electric Co., Ltd., 67, Queen Victoria Street, E.C. 4.—Folder giving brief particulars of the "Little Briton" vacuum cleaner for A.C. The applications to which the cleaners may be put in assisting the cleaning work of the household are very effectively shown pictorially. The trade can have overprinted copies of the leaflet if they make their desires known. Section "M" catalogue of measuring instruments; thoroughly revised, fully illustrated, and containing descriptive matter and prices, which are subject to an advance which is indicated by separate slip. Sixteen-page illustrated list showing various designs of devices for daylight and night electrically illuminated use during Peace celebrations. A number of the devices are shown in colour. "Pixielite" strip and bulb colouring and frosting varnish are among the specialities particularised.

Turner Brothers' Asbestos Co., Ltd., Rochdale.—Pamphlet describing and illustrating their Turners' Trafford tiles and sheets (asbestos cement) for roofing and siding purposes in industrial factories.

Messrs. E. Bennis & Co., Ltd., 28, Victoria Street, London, S.W.—Twelve-page catalogue containing a description—very fully illustrated with line drawings and half-tones—of their steam suction ash conveyor for small boiler houses and installations where the capital cost of a pneumatic suction plant is not warranted.

Sterling Telephone and Electric Co., Ltd., 210-212, Tottenham Court Road, London, W. 1.—A very fine and business-like catalogue of about 150 pages, forms one of the best pieces of practical publicity that has yet reached us indicating that the war is at an end. Photographs of the works at Dagenham follow after a straightforward two-page index, and then we plunge right into the midst of a host of illustrated and priced notices of telephonic apparatus, and parts of same, for all kinds of service, as well as a great variety of electric bells, indicators, pushes, fire alarms, batteries, wires, mine exploders, insulators, &c. There are many special lines to which allusion might be made, but if we single out for mention the new "Era" stock line of automatic interphones, and draw particular attention to the many features of interest for use in mines, that is as much as our available space will permit us to do at the moment. At the end of the volume there are many pages of diagrams of connections, and private code-words and instructions which will be of greater export value as the telegraphic facilities are increased in response to present agitation.

Sloan Electrical Co., Ltd., 8-12, Golden Lane, E.C. 1.—Twelve-page catalogue of designs for outside and inside display in connection with Peace celebrations. They are provided with or without electrical fittings for illuminations. The various designs are illustrated in colours, and prices are given. The highly varnished oil paint colouring is effective by day, and additionally so when illuminated at night. For electrical service each design is wired to a pair of cut-outs in an asbestos-lined box, enabling connection to existing installations to be readily made.

Sterling Sports.—On the afternoon of Saturday, June 28th, the third annual sports of the Sterling Athletic and Social Club (Sterling Telephone and Electric Co., Ltd.) were held on the club ground at Dagenham, when a programme of some thirty odd events was gone through almost to scheduled time. An open five miles handicap proved a great attraction, whilst in the events for associated companies there was a big contingent of athletes and supporters from the Marconi Works at Chelmsford. The employés of several local firms, including Fuller & Co., Fraser & Co., Union Cable Co., Ronco, Williams & Co., also had invitations to compete in several of the principal events, and the number of entries from these neighbouring firms exceeded 500. Prizes were presented by Mrs. Guy Burney. Mr. Burney, on behalf of the members, thanked the donors of prizes, amongst whom were Mr. Godfrey C. Isaacs, Mr. Henry Wm. Allen, Mr. Ernest Cameron, Mr. Sydney F. St. Jermain Steadman, Mr. Chas. E. Sherwood, Mr. A. Anderson, &c. Mr. W. Reynolds Vernon, on behalf of the club, expressed the gratitude of the members to Mr. Guy Burney for his generous and personal interest in the club.

Mrs. Burney was presented with a bouquet, after which she distributed the medals presented by the Sterling Co. to the all-victorious Sterling Ladies' Football Team.

Anglo-Chinese Co-operation in China.—A luncheon was given at Princes Restaurant, on 2nd inst., by Sir Algernon Firth, a Member of the Federation of British Industries, to His Excellency Liang Chi-chao and the Members of his Mission. In the course of his speech, Sir Algernon said that one great consideration which would prove a determining factor in bringing about a peaceful and prosperous era in China, was co-operation. The old order in which China held herself aloof while foreign enterprise sought to force a footing beyond her coastlines had passed away, and the tendency to-day was towards a great and greater measure of co-operation. He could conceive of no more useful form of co-operation than that represented by the combined efforts of the Chinese, with their great good sense, their unrivalled commercial sagacity and their probity, and of the British. He was glad to notice that Anglo-Chinese co-operation was beginning to find shape in many directions, one of the latest evidences being a proposal to form in Shanghai an Anglo-Chinese Club at which the business men of both nations would meet in friendly intercourse. All this was to the good. But they must look forward to an even greater measure of co-operation than that of which they had to-day such promising indications. He understood that the overseas trade organisation of the Federation were giving careful attention to this very matter, and he hoped that one of the results of their study would be the establishment of close and amicable relations between the Federation and important sources of intelligence in China. In replying to the toast, His Excellency Liang Chi-chao enlarged upon the great possibilities that awaited British industrial enterprise in China in actual co-operation with the Chinese themselves. The enormous resources of China in raw material offered an illimitable field for development, but Mr. Liang considered that with the vast changes in trade and transport conditions throughout the world that had been brought about by the war, the obvious solutions lay in working up these raw materials as far as possible in China itself. The desirability of such an economic policy had been quickly recognised by the Japanese, who at a time when Great Britain had her hands tied in Europe neglected no opportunity to establish industrial enterprises throughout the Republic. Mr. Liang mentioned that the Chinese had awakened to a realisation that foreign assistance was necessary to their social and economic well-being. They would be inclined particularly to welcome British co-operation during the period of their country's regeneration, for the name of Great Britain stood for efficiency and integrity, and in no circumstances implied a sinister political programme. This could not be said of all countries. His Excellency, therefore, hoped that British enterprise would bestir itself and take a hand in the industrial development of China. It was, however, of the greatest importance to act without delay as others were in the field in search of monopolies.

The Trade of Cork.—We have received a copy of the first issue of a bound volume of between two and three hundred pages, entitled "Cork: Its Trade and Commerce," which has been issued by the Cork Incorporated Chamber of Commerce and Shipping. It contains a great deal of information, accompanied with many interesting pictorial views, relating to the past history and present position of the commerce and industries of Cork and district, and also concerning the future development of these.

Chinese Tariff.—According to a dispatch received by the London Chamber of Commerce from the British Chamber of Commerce at Shanghai the new Chinese Customs tariff becomes applicable to shipments from July 31st.

The Overseas Service of the F.B.I.—We have received from the Federation of British Industries (39, St. James's Street, London, S.W. 1) a pamphlet of 36 pages setting forth in a very useful manner the activities of the Federation in connection with foreign trade. Many of these activities we have alluded to from time to time during the past six months, but in this pamphlet the story of all these different doings is brought together along with other developments which we have not been able to mention. The work of the Overseas Organisation is described as "a service for manufacturers directed by manufacturers," and its object is to give prompt and efficient assistance to those who desire to export goods or to import raw material. The contents are divided into three main parts. The first describes the Commissioner Service and the Headquarters Organisation, tells where the Commissioners have been appointed and gives their photographs, and says something about the business already done. The second covers such matters as the Greek tour, the exhibition in the Levant, the Lyons Fair, the Paris Delegation, missions to South America, Poland and Serbia, and other undertakings, and it also includes a brief reference to advertisement and co-operative propaganda. In this last direction there is probably room for useful service to be rendered in connection with export trade if the "expert discrimination" referred to is so exercised as to secure the confidence and support of manufacturers and of the responsible Press at home. Part III of the pamphlet tells "Why you should interest yourself in Export Trade," but on that point it is hardly necessary for the Electrical Review to enlarge to-day after the propaganda that it has engaged in to that end for the past 20 years. One of the appendices (No. 11), which indicates the number and character of the actual foreign-trade inquiries received and passed on to the members during the first three months of this year, forms one of the best proofs of the value of the Federation to the British exporter. That there is a great deal of inquiring activity at the present time is known in few places better than it is in the editorial offices of representative trade journals. In all our long experience we have never been asked more frequently than of late for information needed by potential buyers who are anxious to get into touch with the British manufacturers of a specific article or piece of apparatus. The habit of consulting the trade Press in such matters is far from declining.

Non-Ferrous Metals Industry Act.—Lists of further additions to licences granted under this Act, are published in the *London Gazette* for July 1st and July 8th.

Why has he Resigned?—It is announced that Sir A. Steel-Maitland has resigned his position as head of the Department of Overseas Trade. From his letter to the Prime Minister it is obvious that he declines to carry the responsibility for so important a Department under the conditions at present imposed. He appears to doubt whether the Government is really in earnest in regard to the re-establishment of international trade. We hope the business community will unitedly demand the fullest explanation of the reasons for his resignation.

Exports to the Continent.—The present position in regard to the control over exports to Norway, Sweden, Denmark, Holland, and Switzerland is as follows:—

(1) Individual guarantees against re-export are no longer necessary except for goods on Section D of the list of prohibited exports in respect of exports to Holland and Switzerland, and without exception to Norway, Sweden and Denmark.

(2) Goods on Sections A, B and D of the list of prohibited exports can only be exported to Holland and Switzerland and goods on Sections A and B to Norway, Sweden and Denmark provided a licence is first obtained from the Export Licence Department, 1, Queen Anne's Gate Buildings, Westminster, S.W.1.

(3) Goods on the list of "Free" exports may be exported without licence or any formality except such as may be required under the usual Customs regulations.

(4) Goods on Section C of the list of prohibited exports may be exported to Norway, Sweden and Denmark without licence or any formality except such as may be required under the usual Customs regulations.

Such goods (other than those appearing on Section D) when destined for Holland and Switzerland may be shipped (not posted) without licence provided the following regulations are observed:—

(a) HOLLAND.—N.O.T. certificates are no longer required, but all goods other than foodstuffs must be consigned to the Netherlands Overseas Trust for account of the actual consignee.

(b) SWITZERLAND.—S.S.S. certificates need no longer be produced, but "consignable" goods other than foodstuffs (see booklet) must be consigned to the Société Suisse de Surveillance Economique for account of the actual consignee. Should the consignee declare that the S.S.S. will not accept consignment of any goods which may be "consignable," an application for an export licence should be made to the Export Licence Department. The fact that the S.S.S. have refused to accept consignment should be clearly stated on the application form. (Although it is no longer necessary for the certificate of the Société Suisse de Surveillance Economique to be produced in this country before shipment to Switzerland of goods consignable to the S.S.S. can be allowed, it is still necessary for the actual consignee in Switzerland to obtain such certificate before the goods can be handed over by the Swiss Customs. It is therefore important that British exporters should, immediately on the receipt of an order from Switzerland, advise the Swiss purchaser to take the necessary steps to obtain a certificate from the S.S.S.)

(5) For consignments of goods on Section C of the list of prohibited exports (*a*) for the personal use of the consignee, (*b*) for trade purposes of not more than £5 in value, or (*c*) to be exported by parcel post, it is proposed to continue to issue export licences in the case of Holland and Switzerland in order to obviate consignment difficulties. These licences will be issued with the utmost expedition. For such consignments for Norway, Sweden and Denmark no export licences are required (see paragraph 4).

(6) Where licences issued prior to the publication of the above regulations are still held by exporters, the following points should be noted:—

NORWAY AND SWEDEN.—The goods may be consigned direct to the actual consignees even though the licences may stipulate that the goods should be consigned to official bodies or associations for account of the actual consignee.

DENMARK.—Shipment will be permitted under the licences without the production of guarantees.

HOLLAND AND SWITZERLAND.—Shipment will be permitted under the licences without the production of N.O.T. or S.S.S. certificates, even though the production of such certificates to His Majesty's Customs may be stipulated in the licences.

(7) N.O.T. and S.S.S. certificates which under the new regulations are not now required should be handed to His Majesty's Customs for disposal at the time of shipment.

* It is suggested that before any consignments are dispatched, exporters should ascertain by reference to the consignee whether the Société Suisse de Surveillance Economique will accept consignment.

Enfield-Ediswan Cable Works, Ltd.—We briefly mentioned in our last issue that the ENFIELD ELECTRIC CABLE MANUFACTURING CO., LTD., had been acquired by a new company entitled the Enfield-Ediswan Cable Works. This company has a capital of £200,000, divided into 200,000 ordinary shares of £1 each. It is stated that the control and management remain as heretofore, the directors of the new company being Viscount Grimston (chairman), Sir Ralph P. Ashton (deputy chairman), and Messrs. G. J. Andrews and J. Aspin, all directors of the late company, and Mr. A. V. Downton, its technical adviser, together with Messrs. C. J. Ford and C. E. Hunter, the chairman and managing director respectively of the Edison Swan Electric Co., Ltd., which latter company is subscribing for 50,000 shares in the new company, 103,000 shares being issued to the shareholders in the late company as the consideration for the sale of the assets. The business will be carried on on the same lines as before, but it is intended in the near future to enlarge the company's works at Brimsdown, when a considerable increase in the output may be anticipated. The new company will collect all debts and discharge all liabilities of the late company, including the execution of all orders and contracts entered into. Mr. G. F. Plutte becomes general manager of the new company. Mr. John Aspin will act as managing director at the works, and Mr. A. V. Downton as technical director. For the purpose of carrying these arrangements into effect, the old company has gone into voluntary liquidation, and Mr. W. L. Smith, of Millmarsh Lane, Brimsdown, Middlesex, the secretary of the company, has been appointed liquidator.

G.E.C. Annual Sports Meeting. — The annual sports meeting of the GENERAL ELECTRIC CO., LTD., was held on Saturday, June 28th, at the Herne Hill Athletic Grounds, in the presence of a company of about 800. There were 37 events during the afternoon, and these were carried out almost strictly in accordance with the times given in the official programme. Perhaps the most interesting events were the inter-departmental and inter-branch vents. The inter-branch ¼ mile relay, run for the "Hugo Hirst" Challenge Cup, was a spirited contest. London office were the winners, with "Witton" Works a good second. This challenge cup, presented by the managing director of the company, is to be competed for annually. Head office were successful in winning the "Fletcher" Challenge Cup for the London office inter-departmental relay race; the "Osram-Robertson" Works carried off the "Byng" Challenge Cup in the tug-of-war, whilst head office were again winners in the "Railing Challenge Cup" London office tug-of-war. Other events in the programme included obstacle, sack, and potato races, also the "Fire Brigade" race. The 79th (G.E.C.) Division of the St. John's Ambulance Brigade was in attendance. The prizes were distributed by Mrs. Hugo Hirst. A military band gave a programme during the afternoon. After the sports events the assembly were entertained by several well-known concert artistes, and dancing on the lawn took place until 9 p.m.

An Engine-Maker on Industrial Conditions.—In his speech at the annual meeting of Petters, Ltd., held at Yeovil on June 19th, Mr. E. W. Petter in alluding to the company's new developments, said that the company on its manufacturing side, was laying itself out to make its oil engines by methods of mass production, and they meant to turn them out in such quantities and with such accuracy and skill that their competitors could not hope to challenge the Petter engine. On the commercial side they had made a close study of the world's markets, and had taken very deeply to heart all those lessons which had been impressed upon them during the war. They would have a selling organisation which would challenge comparison. They believed that the plans they had made for the future would ensure success given reasonable conditions. There were three partners in industry now—Labour, Capital, and the State. In the form of Excess Profits Duty and Income Tax, the State was going to take about 50 per cent. of the profits of industry in future, but was the State going to take a partner's share in furthering the interests of industry? He was disappointed to see so little done during the present Parliament to assist industry in facing its present problems. What they wanted was for existing markets to be secured to them, and for the State to give active assistance in securing new markets. Our home and foreign markets should be protected from dumping, and this was never more necessary than now when industry was struggling to reinstate itself after five years' dislocation. The thing he was most afraid of in regard to Labour, was the organised attempt which was at present being made by many trade unions to get rid of piece-work. He believed it to be a fatal and suicidal policy. In so far as it was done with a view to finding jobs for unemployed workers, it did more credit to the hearts than to the heads of those who advocated it. The need for manufactured commodities in the world to-day was unlimited. Moreover, the workers had it in their power at an early date to increase the purchasing power of their incomes by increasing their individual output. So long as production was restricted, the purchasing power of Treasury notes became less and less. On the other hand, if production were increased, the competition set up would quickly kill profiteering and the purchasing power of money. Germany was alive to this phase of our industrial situation, and after Peace came the nation that went in for production would be the first to recover from the economic ravages of war. He admitted that there had been abuses in the working of piece-work systems, but human nature being what it was, there was no other way of attaining the full output of which a worker was capable. The skilled and industrial worker benefited immensely from piece-work. It made the difference to him between mere existence and comfortable living. He would not yield to this stultifying and pernicious attempt of the trade unions to reduce the output of the factories, which was alike against the interests of the State, of Capital, and of the workers. On the other hand, he was no advocate of a return to low wages and long hours. The changes that had been made in these respects were all to the good if the workers would give of their best during the working hours.

Recent Trade-mark Applications.—Appended is a summary of the recent applications for British trade marks in respect of productions connected with the electrical industries:—

Vimmy. No. 387,114. Class 15. Sparking plugs. Isaac E. Walton, trading as the Northern Automatic Machine Co., Byre Lane, High Street West, Gateshead-on-Tyne. December 23rd, 1918.

Cyclux. No. 389,641. Class 13. Magneto electric machines for use in lighting cycles. S. G. Brown, Ltd., Edward Road, Willesden Lane, Acton, W. March 27th, 1919.

Akros. No. 389,078. Class 40. Insulating electrical tapes or fabrics composed principally of india-rubber. Ward & Goldstone, Sampson Works, Salford, Manchester. March 10th, 1919.

HH (the two letters joined together in design form). No. 386,537. All goods in Class 8. Also No. 386,538. Class 13. Electrical switch devices. Naamloose Vennootschap Fabriek Van Elektrische Apparaten voorheen F. Hazemeijer & Co., Haaksbergerdijk, Hengelo, Holland. December 4th, 1918.

Design comprising letters H. S. and Target. No. 387,501. Class 13. Electric light fittings of ordinary metal. Henry Summers & Sons, 1A, Essain Street, Stepney, E. January 10th, 1919.

Cadison. No. 386,996. Class 6. Electric light dynamos, &c. No. 386,997. Class 8. Accumulators, not being accumulators for medical batteries. No. 386,998. Class 13. Electric lamps, sparking plugs, &c. Richard E. Cadisch, trading as R. Cadisch & Sons, 171, Great Portland Street, London, W. December 18th, 1918.

Igna. No. 390,279. Class 13. Sparking plugs, warning devices, &c. Herbert J. O. Barton, 41, Ilseley Street, Erdington, Birmingham. April 17th, 1919.

Book Notices.—*Willing's Press Guide*, 1919. London: James Willing, Ltd. 2s.—It is not necessary to say much about this useful directory beyond its own sub-title—"A concise and comprehensive index to the Press of the United Kingdom." There are other features as well, but this is the main service rendered by the book, which we have always found very useful.

"Induction Coils in Theory and Practice." By Prof. F. E. Austin. London: E. & F. N. Spon, Ltd. Price 5s. net.

"Metrology in the Industries." Report of a discussion at a meeting of the Physical Society of London. London: Fleetway Press, Ltd. Price 1s. net.

We have received a copy of an excellent publication issued by the Italian Touring Club of Milan, in which an informative and extremely interesting and impressive account is given of the magnificent part that Italy has performed against such great odds in bringing about the Allied defeat of the Central Powers. The Club has issued by private contribution one million copies of the book in Italian, English, French, German, Spanish, and Portuguese.

The "*Journal* of the National Association of Supervising Electricians" for June, marks a new departure on the part of the Association, which has hitherto modestly contented itself with issuing its papers in pamphlet form. The *Journal* is to be an organ of propaganda—the Association seeks to enrol every supervisor and foreman in the country in its ranks—and a means of communication between headquarters and individual members, and will appear monthly; it will contain, besides reports of the proceedings at the regular meetings, various items of interest and value to the members. The Association is now five years old, and in that period, in spite of war-time conditions, it has made remarkable progress, very largely due to the efforts of the popular and energetic hon. secretary, Mr. C. J. Banister, whose portrait is appropriately reproduced in the first issue of the *Journal*. The chief feature of the first number is a useful paper on "Ship Wiring and Electrical Equipments," by Mr. O. H. Kennedy, A.M.I.E.E. The motto of the Association is *Studiis et Rebus Honestis*, and its initials—N.A.S.E.—are interpreted as "Nearly all Super-Edisons." The *Journal* is certainly a very creditable production, worthy of the thriving and progressive society with which it is associated, and we wish it all success.

Pitman's Technical Bookshelf is a new publication, for the information of technical teachers, lecturers, and others interested in science and technology, issued by Messrs. Sir Isaac Pitman & Sons, Ltd. The first issue gives an account of a number of new works on electrical subjects, and discusses a variety of other matters of engineering interest. We heartily welcome the new departure, which will be of great utility to many readers.

Electrical Developments in Scandinavia.—"Commerce Reports" states, on the authority of a Copenhagen publication, that electric heating has become more and more extensive in Scandinavia. An electrical manufacturing company organised four years ago for the manufacture of electric heating apparatus has during this time extended its operations sufficiently to employ more than ten times the original staff. The factory makes all kinds of apparatus for cooking, ironing, &c., as well as all kinds of lamps and heating materials. By the end of this year, it is expected, the number of employés will amount to 1,200, as against 40 when the concern first started.

On the same authority, it is stated that the use of electromobiles is increasing in Scandinavia generally in preference to that of other kinds of motor vehicles. The Danish postal service has ordered 30 electromobiles to substitute for the old horse wagons, and the Norwegian Government has ordered 50 electro-trucks for transportation of foodstuffs, &c. Electromobiles are also being used very much, lately, for private purposes.

Before the war, when gasoline was plentiful and reasonably cheap, electric automobiles were a rarity in the Scandinavian countries. During the war the subject was under constant discussion in Norway and Sweden, where there is cheap electricity from water power. But the same blockade which made gasoline scarce prevented the importation of electric automobiles from the United States and elsewhere. Also the scarcity of coal tended to increase the demand for hydro-electricity, until even that source of power was becoming absorbed. Meantime no new hydraulic or electrical machinery could be imported for developing the enormous natural resources, and so there has been a uniform reduction in all kinds of automotive service.

As soon as shipping again becomes free there will be an almost unlimited demand from Norway and Sweden for hydraulic and electrical machinery. The lack of coal in all Scandinavia will tend to promote the electrification of all railroads, and the general replacement of steam engines and oil motors by electric motors throughout industrial establishments.

Cables will probably be laid from Norway and Sweden to transmit electric power to Denmark. (There is already a small transmission in existence from Sweden.)

An Association of Electrical Importers.—The Electrical Importers' and Traders' Association ("E.I.T.A.") has been formed, with offices at 97, Cannon Street, London, E.C. 4.

We understand from the secretary, Mr. Frank W. Challis, that several leading firms have already applied for membership. The Association was founded in order to combine importers and traders in opposing the action of British manufacturers who are demanding total prohibition of imports of certain classes of goods in electrical and allied sections. The object of the Association, we are informed, is to oppose any such unreasonable restriction of trade, and to contend by every possible means to secure reasonable facilities for importing and distributing such goods as are required by the public and are not manufactured in this country either in sufficient quantities or of a suitable quality. The Association is understood to be in full sympathy with every legitimate means of fostering home industries and encouraging the handling of British goods, but considers that established importing interests should be fairly dealt with, and is not prepared to see the trade given over to one group of manufacturers to the detriment of consumers. The Committee is of opinion that it is only by combined and aggressive action that common trade interests can be safeguarded during the present critical reconstruction period. This view was strongly endorsed by a largely-attended meeting of traders recently held at the offices of the Association.

French Companies.—The management of the Ateliers de Construction Électriques de Delle have been empowered to increase the present capital of 2,000,000 fr. to 4,000,000 fr. when and in the shape they deem needful.

The Lothringer Kraftsversorgungs Co., which has an extensive distribution network in Lorraine, has changed its title to Forces Electriques Lorraines, in agreement with the change of Government. They are now engaged in extending their network.

Payment of Patent and Trade-Mark Fees.—The Board of Trade has issued a General Licence authorising the payment of fees in respect of the grant and renewal of patents and of the registration and renewal of the registration of trade marks and designs in enemy countries or on behalf of enemies.

"Everybody Works."—This is the new slogan for the coming year given out by Mr. R. H. Ballard, President-Elect of the National Electric Light Association, for members of that Association and all engaged in the American electrical industry. Why not adopt it *in practice* on this side too?

An Appeal from Belgium.—A circular-letter has just been received bearing the signatures of the secretary, the president and the treasurer of the Ecole Professionnelle de Dessin Industriel of Flémalle-Grande (Province of Liége), in which the great difficulties in which it is placed consequent upon the war are described. Formerly the school accommodated 200 workmen as pupils, and its instruction was given free, as financial support was received from the Belgian Government and the manufacturers of Liége. The Government at present has its hands filled with many grave questions, and the manufacturers are not in a position to make donations. The premises of the school were occupied by the Germans, and subsequently destroyed and burnt down. The authorities have struggled against all these adversities, but, apparently, have now come to the end of their tether, and are appealing for help from manufacturers and associations in Allied and neutral lands. In addition to financial gifts, the treasurer, M. E. Pagnoule, rue des Artistes, 28, à Flémalle-Grande (lez-Liége Belgique), asks for catalogues, price lists, and samples from manufacturers who desire to introduce their products into Belgium, and would like them to be displayed to the students in the classrooms. It would be a thousand pities if such an institution had to close down at a time when its operations are more than ever necessary in connection with efforts to re-establish Belgian industrial life.

Magnetos for Disposal.—The Disposal Board, Ministry of Munitions, invites offers for a quantity of magnetos, various types. See our advertising pages to-day.

The Trans-Atlantic Flight.—We are informed that the Sunbeam engines of the Naval Airship R 34—the first airship to cross the Atlantic—were equipped with B.T.H. magnetos, all-British in design and construction.

LIGHTING AND POWER NOTES.

Australia.—MELBOURNE.—The authorities have ordered further economies in gas and electricity, owing to the coal shortage. The new restrictions prohibit electric radiators and gas fires entirely; all lights must be put out by 10.30 p.m.

Continental.—FRANCE.—The Conseil Municipal of Paris has just approved of the execution, during the years 1919 and 1920, of a new programme of works for the distribution of electricity amounting to 12,000,000 fr.

SPAIN.—An important hydroelectric scheme has been drafted for utilising the falls on the River Navia, in the Asturias; 25,000 H.P. is expected to be obtained.

PORTUGAL.—A Spanish company—the Sociedad Electrica del Lima, of Madrid—is establishing a plant on the River Lima at Lindoso, about 8 miles from the Spanish frontier. The generating plant will comprise four 10,000-H.P. Francis turbines by Escher, Wyss & Co., of Zurich, with alternators by the General Electric Co., of Schenectady, U.S.A. The current will be generated at 6,000 volts, and stepped up to 13,000 volts for transmission to Oporto.

Egham.—PRICE REVISION.—The Egham and Staines E.L. Co. has advanced the price of electricity to ordinary consumers to 10d. per unit.

Hawkhurst.—PROPOSED E.L. SCHEME.—The P.C. has passed a resolution in favour of the town being supplied with electricity by the Hastings T.C.

Halifax.—Year's Working.—The total income of the Corporation electricity undertaking for the year ending March 31st amounted to £111,412, as compared with £100,145 for the previous year. The expenditure amounted to £101,803, contrasted with £87,862, resulting in a profit of £9,609, as against £12,283.

Herne Bay.—Price Revision.—The price of electricity has been increased from July 1st as follows:—Private lighting to 8d. per unit; power and heating, 4d.; kinema arcs, 4d.

Kendal.—Year's Working.—For the year ended March 31st the total revenue of the electricity department was £2,718; expenditure, £2,672; gross profit, £46; capital charges amounted to £1,261, leaving a deficit of £1,215.

Keighley.—A L.G.B. inquiry was held on the 2nd inst. into the application for sanction to borrow £72,773 for electricity purposes. It was stated that £39,773 had already been expended on mains, services, machinery, &c., and £33,000 was needed for new expenditure. Mr. Hooper (Inspector) adjourned the inquiry for the production of particulars as to £46,000 of the amount applied for.

Kettering.—Year's Working.—The accounts of the electricity undertaking to March 31st show total income £25,362, working expenses £18,548, loan repayments £6,832, deficit £18.

London.—Fulham.—Year's Working.—The accounts of the electricity undertaking show a net profit of £9,058; the Finance Committee recommends that £3,242 be transferred to capital account, and £5,000 to machinery maintenance reserve account.

Kingston-on-Hull.—The Corporation E.L. order, 1914, has been extended for six months from July 31st, 1919.

Maidstone.—Price Revision.—Revised scale of charges for electricity, as from July 1st:—Lighting, m.d. system, 8d. and 3d., plus 25 per cent.; telephone system, 10s. per 30-watt lamp per annum, plus 2d. per unit; fixed charge, 18s. per annum for each 30-watt lamp; flat rate, 6½d.; heating, 1½d.; cooking, 1d.; power, percentage increase raised from 20 to 25, and 10 per cent. to consumers supplied under agreement with a coal clause.

Rathmines.—Minimum Charge.—The U.D.C. has fixed the minimum charge for electrical energy at 10s. 6d. per quarter for each consumer from October 1st.

Rochdale.—Loan Sanction.—The L.G.B. has sanctioned loans of £1,640 and £3,873 for excess expenditure on mains and services, £35,000 for mains, £27,000 for transformers, and £800 for buildings.

St. Helens.—Price Revision.—The T.C. has increased the price of electricity as under, as from July 1st:—Power and industrial purposes, 2d. for the first 100 units per month, and 1d. beyond, with the following discounts per monthly consumption: 1,000 to 5,000 units, 2½ per cent.; 5,000 to 10,000, 5 per cent.; 10,000 to 20,000, 7½ per cent.; beyond, 10 per cent. Consumers with a minimum load factor of 30 per cent. consuming from 30,000 to 40,000 units per month, 12½ per cent. discount; 40,000 to 60,000, 15 per cent.; 60,000 to 100,000, 17½ per cent.; beyond, 20 per cent., with a further 2½ per cent. for prompt payment of accounts.

Thornton.—The B. of T. has extended the time until January 8th, 1920, of the Thornton Electric Lighting Order.

Tunbridge Wells.—Loan Application.—The T.C. has decided to apply for a loan of £30,000 for additional plant and mains.

Walton-on-the-Naze.—L.G.B. Inquiry.—A B. of T. inquiry was held last week relative to the electricity undertaking of the Coast Development Corporation, it being alleged that the conditions at the works, and of the system generally, were not such as to render it possible to provide light and power requisite under the order, and that the state of the poles and overhead mains were such as to constitute a public danger.

Winchester.—Street Lighting.—The T.C. has decided to terminate the agreement with the gas company for public lighting, and to negotiate a new contract giving the Council freedom to install electricity in any street.

TRAMWAY AND RAILWAY NOTES.

Accrington.—New Cars.—The Tramways Committee has decided to purchase two double-deck and two single-deck bogie cars.

Blackpool.—Sale.—At a special meeting of the Blackpool and Fleetwood Tramroad Co., held on July 1st, approval was given to the Bill for transferring that undertaking to the Blackpool Corporation.

Bournemouth.—Sorbitic Treatment of Rails.—The experimental Sorbitic treatment of rails having given satisfactory results, a further two miles of single track is to be treated.

Burnley.—Extensions.—The Tramways Committee has under consideration the extension of the tramway system. The total length of the lines proposed is 5 miles 69 chains. The cost, based on pre-war expenditure, would have been £70,597, but the present estimate is £141,194.

Canada.—The Toronto tramways resumed running on Friday, last week; the award of the Board of Conciliation gives the employés a minimum wage of 50 cents an hour and a maximum of 55 cents.—*Times.*

Doncaster.—Loan Application.—The T.C. is to apply to the B. of T. for sanction to borrow £17,250 for doubling the tramway track on the Balby route.

Edmonton.—Electric Vehicles.—The U.D.C. has decided to borrow £10,000 for electric dust-carts.

London.—L.C.C.—Reduced fares for children under 14 came into operation on the Council's tramways on Sunday last; for 1d. a child may travel an ordinary 2d. distance (about 3 miles), and 2d. will cover any further distance on one car.

Electric Vehicles.—The Highways Committee of the L.C.C. recommends the provision of four electrically-driven tower wagons, together with battery-charging plant (estimated cost £7,000), for use on the Council's tramways.

Northampton.—The B. of T. has extended the time for the construction of tramways under the Corporation Act, 1911, for one year.

York.—Railless System.—The Tramways Committee has recommended the adoption of the railless trolley system to Heworth, at an estimated cost of £3,688 for overhead equipment and £8,000 for four cars.

Loan Application.—The City Council is to apply to the B. of T. for authorisation to borrow £10,000 for extra tramcars, and £7,400 for track work, &c.

TELEGRAPH AND TELEPHONE NOTES.

Cable Delays.—In answer to questions in the House of Commons, the P.M.G. stated that the delay on outward messages to the East had been reduced by about one day, Indian telegrams now taking four days; the inward rate had not improved. An important cable in the Mediterranean was interrupted. Wireless was used to some extent, and the service would soon be considerably increased.

New Zealand.—There is every prospect of material for 10 automatic telephone exchanges arriving in New Zealand within the next few months. The material for Courtenay Place, Wellington, has already arrived, and the exchange is almost ready for the opening of the service.

United States.—On June 5th the Postmaster-General issued an order restoring the telegraphs and telephones to the control of the companies so far as operation was concerned, but the Government will remain responsible for the service until legislation now pending is passed through Congress. On the issue of the order, the Commercial Telegraphers' Union extended the Atlanta strike to include all the companies, but the response was poor; the Western Union Telegraph Co. stated that out of more than 40,000 employés, only 175 were absent from work.—*T. and T. Age.*

Wireless Litigation in the U.S.A.—The Marconi Wireless Telegraph Co., of America, has obtained judgment against the Atlantic Communication Co., which operated the high-power station at Sayville, Long Island, before the war, in connection with German interests. The subject was the use of the audion, which was held to infringe the Marconi Co.'s Fleming patent of November 7th, 1905. The Sayville station was taken over by the U.S. Government during the war. Damages are to be assessed against the defendant company, whose assets are in the hands of the Government.—*T. and T. Age.*

Wireless Telegraphy on Board Ship.—The Merchant Shipping (Wireless Telegraphy) Bill, which requires every passenger and cargo steamer of 1,600 tons and upwards to have a wireless installation, was read a second time in the House of Commons on July 3rd.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia.—Sydney.—August 27th. N.S.W. Railways and Tramways Department. Three-phase induction motors. Chief Electrical Engineer, 61, Hunter Street, Sydney.—*Tenders.*

Melbourne.—August 27th. Secretary for Railways. Electric capstan for Newport power house (contract No. 32,381). Local representation.*

Battersea.—The B.C. is recommended to obtain tenders for a coal store elevator and conveyor at the electricity generating station.

Bedford.—July 14th. Electricity Committee. Turbo-alternator and condensing plant, boilers, &c. (June 20th.)
July 21st. Electricity Committee. Buildings, electric motors, &c., coal conveyor, runaway and chutes. (June 27th.)

Birkenhead.—July 28th. B. of G. Installation of internal telephones. (June 6th.)

Darlington.—July 11th. Electricity Department. Rotary converter, cooling tower, water-tube boiler, economiser, and induced draught fan. (June 20th.)
July 16th. Lead-covered and armoured cables. (July 4th.)

France.—Paris.—September 2nd. Administration des Chemins de fer de l'Etat. Electric equipment of a sub-station of the Bellevue Funiculaire. Particulars, Bureaux du Service électrique (2e division), 43, Rue de Rome, Paris.

Gravesend.—July 12th. Electricity Department. One 2,000-kw. turbine with 6,000/6,600-volt 3-phase alternator, condenser with motor-driven air and circulating pumps. (June 20th.)

Nuneaton.—July 15th. Electricity Department. 1,350 yd. .6 × .1 × .6, three-core, paper-insulated, armoured feeder cable, feeder pillar, distributors, link disconnecting joint-boxes, &c. (July 4th.)

Redditch.—July 28th. U.D.C. High-pressure steam, exhaust and water-circulating piping. (July 4th.)

South Africa.—The Strand, Cape Province.—July 31st. Municipal Council. Material and plant for the electric lighting of the municipality. Town Engineer.

*A copy can be seen at the Inquiry Office of the Department of Overseas Trade (Development and Intelligence), London.

CLOSED.

Battersea.—Electricity Undertaking Committee. Recommended :—
Additional boiler plant and induced draught plant at the electricity generating station, £19,187.—Babcock & Wilcox and Musgrave, Ltd.

Burnley.—At last week's Council meeting, Councillor Holden, chairman of the Electricity Committee, stated that at the previous meeting, he had, with consent, withdrawn a minute with reference to the acceptance of a tender for the supply of 6 300 yd. of cable. Since the Council meeting he had received an offer from Messrs. Siemens Bros. & Co., Ltd., of Woolwich, to supply the cable required for £1,818, instead of their original price of £2,187, and he had considered it advisable to accept Messrs. Siemens's offer at once. The Committee recommended the Council to approve the chairman's action. The minutes were approved.

Glasgow.—Clyde Trustees. Accepted :—
John T. Cartwright, Glasgow, supply of carbons for six months.

Ireland.—The General Engineering Co. (Salford), Ltd., of Manchester, have secured the contract for installing electric power throughout the entire saw mills and buildings of Mr. J. J. Stafford, Paul Quay, Wexford, including the power-house equipment, &c. They have also received the contract for the power-house plant battery house, mains installation and lighting services, for the town of Bandon, Co. Cork.

London.—L.C.C. Stores and Contracts Committee. Tender accepted during the three months ended June 30th :—
Electric traction lamps (schedule No. 17a.).—Maxim Lamp Works, Ltd.

Torquay.—T.C. Two transformers. British Electric Transformer Co., £109 10s. each.

Tuam.—Electric Light & Power Co., Ltd. Accepted :—
Two 90-b.h.p. gas engines and suction gas plants, £2,980.—National Gas Engine Co., Ltd.
Two dynamos, &c., £1,458.—English Electric Co., Ltd.
Batteries, £690.—Tudor Accumulator Co., Ltd.
Switchboard, £365.—Whipp & Bourne, Ltd.

FORTHCOMING EVENTS.

Physical Society of London.—Friday, July 11th. At 3 p.m. Visit to the National Physical Laboratory, Teddington.
British Scientific Products Exhibition, Central Hall, Westminster.—Open daily 11 a.m. to 7 p.m.; Saturdays 12 noon to 9 p.m.; closes August 5th.

NOTES.

The "Electrical Review" Index.—As it is still necessary to effect every possible economy in paper consumption, the Index to Vol. LXXXIV of the Electrical Review, which will shortly be printed, will be supplied only to those who, through the post, specially apply for it. To such it will be supplied for 3d. post free. Any reader or advertiser at Home or Abroad who requires a copy for binding or other purposes is asked to make early application therefor to the Publisher, Electrical Review, 4, Ludgate Hill, E.C. 4.

Fatal Accident.—The *Times* records that John Rodney Mayne (18), electrician, son of Captain Mayne, of the central power station at Aldershot, has died at Aldershot as the result of a gunshot wound accidentally received while rabbiting.

Fuel Economy.—The Household Fuel and Lighting Order for 1919 is published in full in the *London Gazette* of July 1st, 1919. It is dated June 23rd, 1919, and extends to coal, gas, and electricity used for all domestic purposes, throughout Great Britain. Registration with a coal dealer for coal is compulsory, but consumers not requiring more than 5 tons of coal in the year commencing July 1st, 1919, together with 12,500 cb. ft. of gas, and 400 B. of T. units of electricity, per quarter need not take any further steps. Consumers of larger quantities must apply to the Local Fuel Overseer for certificates. Coal supplies during the summer months (May to October inclusive) will be restricted to half the allowances for winter months; gas and electricity supplies will be allocated equally to each month of the year. Conversion ratios are :—One ton of coal = 18,750 cb. ft. of gas = 1,000 units of electricity = 30 cwt. of coke; but a consumer may not, without permission, take more gas or electricity than in the previous year.
Instructions are included for the guidance of electricity supply undertakers with regard to their duties under the order; restrictions are imposed upon the making of new connections or the installation of new appliances without the assent of the Local Fuel Overseer. Previous orders are cancelled, and the new order was to come into force on July 1st.

The Nobel Prizes.—It is stated in the *Times* that distribution of the Nobel prizes for 1919 for Physics, Chemistry, Medicine, and Literature, as well as the prizes for the same subjects held over from 1918, is being postponed till June 1st, 1920.

Copper Prices.—Messrs. James & Shakespeare report, July 8th :—Copper bars (best selected), ditto sheets and ditto rods, £127, £6 increase.
Messrs. F. Smith & Co. report, July 8th :—Electrolytic bars, £99, £6 increase; ditto sheets, no change; ditto wire rods, £109, £8 increase; ditto H.C. wire, 1s. 1½d., ¼d. increase; silicium bronze wire, 1s. 6d., 1d. increase.

Educational.—The Treasury has appointed a Standing Committee to inquire into the financial needs of University education in the United Kingdom, and to advise the Government as to the application of any grants that may be made by Parliament towards meeting them. The Committee will be known as the "University Grants Committee," and Sir William M'Cormick will be chairman. Increased grants, a single advisory body, and a method of distribution which will give the individuality of each institution free play, and will safeguard the legitimate interests of university autonomy, are the main points which the Government has had in mind. The annual grant in aid of University education has this year been raised to £1,000,000. A sum of £500,000 has also been provided as a special non-recurrent grant to aid Universities in establishing their work after the war on a basis of unimpaired efficiency. The Board of Education will cease to make grants under the provisions of the "Statement of grants available for technological and professional work in Universities," which will now be withdrawn. The annual sums allocated to the different institutions will take the form of inclusive block grants to be expended at the discretion of the governing bodies, will remain fixed for a prescribed period of years, and will be regularly reviewed at the expiry of the prescribed periods.—*The Times.*

British Scientific Products Exhibition.—On Thursday, last week, Lord Crewe opened the second exhibition of British Scientific Products, which is being held at the Central Hall, Westminster, under the ægis of the British Science Guild. Lord Sydenham, president of the Guild, presided at the opening ceremony, and Sir Richard Gregory explained the objects of the exhibition; he pointed out the necessity of employing scientific research in order to develop established industries and to encourage the formation of new British manufactures.
Lord Crewe, in opening the exhibition, referred to the re-establishment in this country during the war of essential industries which had been lost, and said that under Peace conditions we would not throw away the fruits of the work thus accomplished. He advocated industrial courses for science students during their vacations, and described the operations of the Department of Scientific and Industrial Research in collaboration with manufacturing associations.
Lord Moulton said that Germany had become the source of certain articles by skill in cornering raw materials, by the excellence of her salesmen, and by the application of scientific knowledge to the improvement of her products. The British possessed the power of research and invention, of concentration, and of co-operation—all that was necessary was that the nation should realise the necessity of applying those powers in Peace as in war.
Sir Philip Magnus pointed out that the work of our scientific men during war had shown that we needed, not so much to improve their quality, as to increase their number very largely; technical science must be as much a part of our educational system as any other subject.
A review of the exhibits will appear in our later issues.

American Engineering Standards.—The American Engineering Standards Committee has revised its constitution and become an Association, like its British prototype, on which its organisation appears to be based. A full statement of the objects and methods of the Association was published in the *Electrical Review* of Chicago, June 14th.

Multiplex Telephony.—Recently the Canadian Independent Telephone Co. carried out an interesting experiment over the Toronto-Dundas telephone line of the Ontario Hydro-electric Power Commission. Due to the operating conditions in this district the ordinary metallic system has become very indistinct and frequently quite useless. The experiment was in charge of Dr. Lee de Forest, with Prof. C. A. Culver and his staff, and according to the *Electrical News* the application of the oscillating audion to multiplex telephony met with complete success.

The demonstration was carried on over a pair of telephone wires extending from the power station at Toronto to that at Dundas near Hamilton, a distance of over 40 miles. The apparatus was arranged at the power stations, and tests were made over the three miles of cable extending from the power station at Toronto to the central office of the Hydro-electrical Commission. These tests showed that the presence of the three miles of cable caused no appreciable attenuation to the service, a result which may come as a shock to some mathematical telephone experts. Two complete transmitters and receivers were installed at each end of the line. Four distinct wave lengths were employed ranging from 16,000 to 12,000 metres. Additional tests were made using wave lengths of 600, 1,000 and 1,600 metres. Contrary to all expectations, the results obtained with the higher frequencies (the highest being 500,000 per second), were even better than those one-twentieth as great. The demonstration showed by actual trial that at least seven simultaneous conversations could be carried on without interference of one with any other, and without in any way disturbing the physical circuit. The existing conditions of the line were not disturbed in any way except by momentary interruption while choking coils were being introduced. It was found later that these choking coils were not necessary. The quality and loudness of the speech left nothing to be desired. Visitors who had never seen the apparatus before and knew nothing at all about its manipulation experienced no difficulty whatever. Simultaneous talking and listening was carried on the same as over an ordinary telephone circuit, no switch-over device being employed. The success of the demonstration using these high frequencies, so new to the wired telephone art, upsets a good many preconceived and orthodox notions of the limitations of telephone operation and engineering. Thus with two pairs of wires, 60 independent telephone conversations can be carried on without using the earth, and with earth connections six additional circuits can be provided which should be suitable for telegraph purposes. Over each of these latter circuits it would be possible to carry on ten additional telegraph communications suitable for high-speed work. It has been demonstrated that for this form of telephone communication galvanised iron wires answer admirably. There is no question but that most power transmission conductors can be used for telephone purposes as well.

Water-power in German Austria.—In the course of a series of articles which recently appeared in the *Geographische Zeitschrift* from the pen of Prof. Krebs, of Frankfort, some interesting information is given respecting the coal deposits and output of the Sudetic lands. Unfortunately, says the writer, coal plays but a minor rôle as a source of power for industrial concerns. In the Alps only the Upper and Central Styrian lignite deposits have some local importance, but they are insufficient for local industries as well as for traffic in Austria, which meets its fuel requirements in part from the South Slav coal district of Trifail and Sagor on the Save. Vienna has to rely on Silesian coalfields outside the districts where German is spoken exclusively, while the greater part of the Alpine foreland and the Alpine districts depend on Bohemian coal. Of these deposits only the lignite of North-West Bohemia is in German hands. The richest and most lasting coal deposits, viz., those of Western Galicia, and possibly those of Upper Silesia as well, are to be lost to the German people. It is therefore the more satisfactory that in electric power there is a substitute which, particularly in the highlands of German-Austria, offers great possibilities for the future. This is a further advantage to German-Austria since she will not come empty-handed to Germany: for the more the coal is exhausted the more important water-power will become, and the result will be that the industrial centres will be moved to the highlands. Since the power stations in the Sudetic lands and the Erzgebirge are of modest dimensions, those of the Alps are all the more important, although only in the Vorarlberg, West Tirol and Salz-Kammergut have they been thoroughly developed. The Austrian water-power register for 1914 gives for the Alpine districts 1.5 million H.P. at low water, *i.e.*, in winter, and over 6 million H.P. at high water, *i.e.*, in summer.

In 1910 there were 400 central power stations in the Austrian Alps, but up to the outbreak of the war only a fraction of the water-power was utilised, owing to questions of proprietary rights and to the electrification of the Alpine railways contemplated by the State, but not yet carried out for strategic reasons. The prospects for the future are the more favourable, for while in Germany approximately one-third—445,000 H.P.—of the available water power—1,350,000 H.P.—is utilised, between one-sixth and one-tenth is made use of in Austria. The time is approaching when not only will industrial activity in the Alps be markedly increased as regards large power stations, but the entire Austrian and Bavarian Alpine foreland will be supplied with electric power by means of long-distance lines. The Salzkammergut works of Stern and Hafferl, whose network of lines extends to the Danube near Linz, are merely the beginnings of a highly promising development.

Invisible Light.—In a demonstration of the uses of invisible light in warfare by Prof. R. W. Woods, Johns Hopkins University, the first device shown was a signalling lamp consisting of a 6-volt electric lamp with a small curled-up filament, at the focus of a lens of about 3 in. diameter and 12 in. focus. This, according to the *Proceedings* of the Physical Society of London, gives a very narrow beam, only visible in the neighbourhood of the observation post to which the signals were directed. In order to direct the beam in the proper direction, an eyepiece was provided behind the filament. The instrument was thus converted into a telescope, of which the filament served as graticule. When directed so that the image of the observation post was covered by the filament, the lamp, when lit, threw a beam in the proper direction. In many circumstances the narrowness of the beam was sufficient to ensure secrecy; but sometimes it was not desirable to show any light whatever, and filters were employed to cut out the visible spectrum. By day a deep red filter, transmitting only the extreme red rays, was placed in front of the lamp. The light was invisible to an observer, unless he was provided with a similar red screen to cut out the daylight, in which case he could see enough to read signals at six miles. By night a screen was used which transmitted only the ultra-violet rays. The observing telescope was provided with a fluorescent screen in its focal plane. The range with this was also about six miles.

For naval convoy work lamps are required which radiate in all directions. Invisible lamps for this purpose were also designed. In these the radiator was a vertical Cooper-Hewitt mercury arc, surrounded by a chimney of the ultra-violet glass. This glass only transmits one of the mercury lines—viz., $\lambda = 3{,}660$ A.U., which is quite beyond the visible spectrum. Nevertheless, the lamp is visible at close quarters, appearing of a violet colour, due to fluorescence of the retina. The lens of the eye is also fluorescent. This gives rise to an apparent haze, known as the "lavender fog," which appears to fill the whole field of view. Natural teeth also fluoresce quite brilliantly, but false teeth appear black.

Reverting to the use of the lamps at sea, they are picked up by means of a receiver consisting of a condensing lens in the focal plane of which is a barium-platino-cyanide screen the full diameter of the tube. An eyepiece is mounted on a metal strip across the end of the tube. When the fluorescent spot has once been found somewhere on the screen, it is readily brought to the central part and observed with the eyepiece. The range is about four miles, and the arrangement has proved invaluable for keeping the ships of a convoy together in their proper relative positions by night.

Inquiries.—Makers or suppliers of Nernst lamp burners and resistances, of the "Thermo-Fox" electric circulator, and of the Shaw electric copier for making blue prints, are asked for.

Decimal Coinage.—The Metric System Committee of the British Science Guild has prepared a statement on the subject of decimal coinage, which says that, quite apart from the question of convenient units for the coinage, the adoption of a single monetary unit and the foundation of a circulating coinage solely on that unit and the decimal multiples and sub-divisions thereof will facilitate transactions in the metric system, and be of great advantage in financial calculations of most kinds.

The fractions of the unit to be the smaller circulating coins should permit of the retail purchaser of an article getting the immediate or speedy benefit of small diminutions of the cost of the article to the retail seller; and, on the other hand, should permit of the passing to the purchaser of small increases in the cost to the seller without raising the retail price by more than the actual increase in that cost.

The importance of this (and the inadaptability of the present coinage in this respect) has been exemplified and appreciated in the effect of increased taxation of necessary articles, such as sugar, habitually bought in small quantities by the poorer classes, the retail price of small quantities being raised by an amount, expressed in circulating coin, exceeding the proportion of the duty attributable to the quantity sold. The retail seller (to whom a small diminution of profit on a large number of transactions might be a serious matter) could only protect himself in this way, and it could not be called an unjustifiable overcharge. The same consideration would prevent him from lowering the retail prices on a diminution of duty in analogous cases. The poorer classes thus are called upon to pay a higher price than they would have to pay under the ordinary operation of supply and demand if the circulating coinage permitted of sufficiently minute sub-divisions of gross increases or diminutions and expression of the sub-divisions in terms of current coin.

The committee considers that it is not advisable to enforce or promote a change of this kind by statutory penalties, or by rendering absolutely void at law transactions conducted or recorded in terms involving monetary units, or multiples and sub-divisions in all future coinage; the withdrawal in ordinary course of all existing circulating coin not equivalent to some item of such future coinage will answer all practical purposes. Contracts involving the expression of money values or prices should not be enforceable in the court of law except in terms of the new unit and coinage, and the expense of officially certifying the equivalent in those terms of the terms used in making a contract, or conducting a transaction alleged to amount to a contract, should be put upon the party who seeks the aid of the court.

Electric Traction in Germany.—The following notes from the *Verkehrstechnische Woche* are interesting as showing the German point of view: Electric traction is more efficient; it admits of the building of locomotives for any type of traffic and of any size, drawing power and speed. The personnel required is less, and it is more economical and saves large quantities of coal. According to the writer only 5 million tons of coal per annum would be required for working the Prussian State railways, whereas 13 million tons are required for steam locomotives. In running railway power stations with combined gasification plant, in which low-grade fuels could be used, it is estimated that the quantity of by-products gained would amount to half a million tons of ammonium sulphate, 1 million tons oils and gases for every 20 million units generated. It is further stated that the objections raised by the military authorities no longer hold, as the possibility of another war is very remote. Even from this point of view, electric traction would not have the disadvantages which have been ascribed to it. The Prussian railway administration is about to commence experimenting with oil-fired locomotives, possibly fitted with Diesel engines, and used on electrified sections of the system, thus relieving some of the load coming on to the power stations. These oil engines will use by-products from the railway generating stations, and their number, forming about one-fifth of the total locomotive contingent, will thus be available for war purposes where trains have to be hauled over enemy tracks which are not yet electrified. In addition to the Diesel engines and electric power-transmission to the live axles, which have been proposed, important work is now in progress for the development of oil locomotives with gas turbines and electric power transmission. The use of single-phase A.C. at 16⅔ cycles per sec. and 15,000 volts line-voltage has been agreed upon between the railway administrations of Baden, Bavaria, and Prussia. It is thought that Saxony and the other States will also come into line unless the proposed unification of the railway systems of Germany renders this superfluous. Although the work necessary to introduce electric traction on to the lines Magdeburg-Leipzig-Halle and the Silesian Mountain Railway was interrupted by the war, the Prussian State railways have already carried out trials with new types of locomotives of capacity up to 3,000 H.P. The results of these trials show that the number of fundamental types can be restricted to three or four. The work on the sections mentioned above was resumed last November, and it is hoped to have them in running order by about the middle of 1920.—*Technical Supplement to the Review of the Foreign Press.*

Foreign Trade.—The June Figures.—The following are the electrical and machinery figures given in the official returns of imports and exports for June:—

	June, 1919.	*Inc. or dec.*	*6 months*, 1919. *Inc. or dec.*
Imports.	£	£	£
Electrical goods, &c. ...	76,352	− 39,470	+ 151,380
Machinery	1,049,355	− 90,478	+ 2,037,897
Exports.			
Electrical goods, &c. ...	492,744	+ 340,750	+ 1,103,024
Machinery	2,534,744	+ 962,764	+ 4,149,974

Improved Transport Facilities.—Sir A. Geddes, in the House of Commons, stated that a Committee was to inquire into Mr. A. W. Gattie's proposals for improving the methods of handling goods and traffic, and to consider the practicability of the introduction of any of the suggested improvements into the existing transport system. Sir J. Fortescue Flannery, M.P., would be chairman.

Institution Notes.—Diesel Engine Users' Association.—At the meeting in June the President, Mr. Napier Prentice, reported that application had been made for a Government grant in connection with the carrying-out of research work and tests on liquid fuels for Diesel and semi-Diesel engines, more especially on fuels produced in this country.

The application of the Household Fuel and Lighting Order, 1918, to electricity supply undertakings using oil as fuel in place of coal was discussed. It was pointed out that the application of the Order to such undertakings at the present time was placing an unnecessary check on the output of electrical energy in the districts supplied by those undertakings, and that there could be no reason for consumers of electricity for lighting, heating, or power purposes to be inconvenienced by restrictions in any area in which the supply of electricity was not derived from the burning of coal in furnaces under boilers. It was suggested that, on the contrary, every encouragement should be given to developing as speedily as possible the greatest use of electric power in such areas of supply. A resolution to that effect was unanimously passed, copies of which were to be sent to the Board of Trade, to the Controller of Coal Mines and to the Chief Electricity Commissioner Designate.

Mr. Geo. E. Windeler read a short paper on "A Method of Checking the Alignment of Diesel Engine Shafts, and a Means of Proving if a Shaft is Actually Bedding in its Bearings." The end movement of the shaft, in excess of the actual mechanical clearance allowed, was an indication that springing of the crankshaft was taking place for want of proper support, and that actually the shaft was being extended and contracted in length by the opening and closing of the gap between the crank webs. A measure of this distortion was taken by measuring with a suitable instrument the distance between the crank webs when the crank pin was on the top centre, and when it was on the bottom centre. A few thousandths of an inch difference in these two measurements indicated that the shaft was out of line. The method was especially valuable in regard to checking the alignment of outboard bearings.

Royal Society of Arts.—The report of the Council for the past year states that the adverse balance of £347 for 1917 has been converted into a credit balance of £796 for 1918, mainly due to the remission of income-tax and the return of £799. Annual subscriptions, £4,746, showed an increase of £640, and life compositions, £1,035, made a new record, an increase of £474 over 1917. During the year, 455 Fellows were elected.

Radio-Vacuum Tube Agreement in U.S.A.—During the war litigation over rights for the manufacture and sale of vacuum tube detectors for radio work was suspended by common consent, and tubes for Government use were made at various works. As the situation stood at the close of hostilities an attractive market for bulbs was in prospect, but patent rights prevented any one manufacturer from entering the field independently. The Marconi Co. held rights covering the use of a two-element bulb, Dr. De Forest's patents protected the use of the third element, and the Moorhead Laboratories in San Francisco had patented other features also essential to the commercial production of the best tubes, among these being the use of a chemical process for exhausting air. During the war the Moorhead Co. had developed manufacturing facilities rapidly and bulbs were being turned out for the Allied Governments at the rate of 30,000 per month.

Early in May representatives of the Marconi, De Forest, and Moorhead Companies held a conference in San Francisco, and agreed that the patent rights of all three should be extended to the Moorhead Co., for which the latter should make payment to the other two on a royalty basis. This company is only permitted to make receiving and amplifying tubes, the Western Electric Co. having the rights to manufacture the transmitting tubes. It was also agreed that the Marconi Co. would become the sole sales and distribution agent for the Moorhead output. The tube produced under this agreement is to be known as the Moorhead audion. Government contracts still operative will call for 15,000 bulbs per month, and within sixty days after the date of the contract the Marconi Co., in the capacity of main distributing agent, is to receive bulbs at the rate of 50,000 per month.—*Electrical World.*

Parliamentary.—The opposition of the South Wales Electrical Power Co. having been withdrawn, the House of Commons Committee on Thursday, last week, passed the preamble of the Bill promoted by the Bedwellty Urban District Council for the acquisition of the Rhymney Valley General Electric Power Co. for electricity, gas, and other purposes.

Plant for Sale.—Middleton Corporation invites offers for one battery panel, booster panel, and two automatic battery regulators, also milking booster. For particulars see our advertisement columns to-day.

Appointments Vacant.—Meter tester (£228) for the Barrow-in-Furness Corporation electricity department; lecturer on electrical engineering and wireman's work (£250) for the Barnsley Education Committee; instrument maker (£260) for the East London College; repairs assistant (105s.) for the Battersea B.C. electricity department; shift engineer (60s. to 70s.) for the Falkirk Corporation electricity department. See our advertisement pages to-day.

Auction Sale.—Assets Auctions Co., Ltd., will sell by auction at Newington Causeway, on July 17th, the remaining stock of a Government contractor, consisting of conduit tubing, electric drying ovens, &c. See our advertisement columns to-day.

REVIEWS.

Public Utility Rate Fixing. By C. E. Grunsky. San Francisco: Technical Publishing Co. Price $2.50.

In the interesting volume before us are presented the author's views on the rate regulation of public utilities with special reference to the earnings "that should be allowed" to public utility companies, a subject of which at present we do not appear to have any counterpart in this country, though it is perhaps not impossible that some analogous system may find a place eventually among the provisions in the National Electricity Supply Bill. To many readers on this side of the Atlantic, however, the volume would appear to lack some preliminary information as to the constitution, scope, general powers and other incidental detail relative to rate-fixing authorities. In this connection the following brief extracts of commission rulings from the *Electrical World* shed a little light.

(*a*) "The Public Service Commission of Pennsylvania has handed down a decision in the case brought by a consumer of the Harrisburg Gas Co. protesting against discontinuance of service, and orders the company to arrange for the immediate resumption of such service even though the existing bill had not been paid"; (*b*) "a temporary order issued by the Illinois Public Utilities Commission in the case of the Canton

Gas and Electric Light Co. requires reparation if the rates authorised are in excess of rates fixed by a temporary order. The Commission has accepted the schedule filed by the company, which in general increases the rate 1 per cent. per KW.-hr. for all classes of consumers"; and (c) "the Mountain Light and Water Co., which supplies current in Brokdale, by a decision of the California Railroad Commission is permitted to charge new rates" . . . .

The interests of the user or right of user are presented as requiring satisfaction in respect of—

(*a*) Good service; the best that conditions permit at reasonable rates.

(*b*) A share in the unearned increment when general prosperity gives this to the owner of the utility in too large a measure.

(*c*) A reasonable share in course of time in the benefit that results in any material reduction of operating costs due to the introduction of inventions, or new processes that the owner's good management and skill have shown to be advantageous.

(*d*) A contribution by the general public towards the maintenance of the utility which may be secured by a liberal payment for services rendered or commodities supplied to the public or to public institutions, or which may be secured by a remission of local taxes in whole or in part.

On the other hand, the stated rights of the public utility owner are:—

1. Interest on capital legitimately invested.
2. An ample allowance for replacements and renewals.
3. An ample allowance for operating expenses.
4. Amortisation of capital invested in abandoned property.
5. Compensation for management and for assuming business hazards.
6. A share in the general prosperity which the utility helps to create.
7. In the special case of a limited life of the utility or its acquisition by the public a return of the capital invested.

Whilst because of the present State control of utility bodies in the U.S.A. both user and owner should demand the introduction of such a method of procedure when rates are to be regulated that there would not be required an array of valuation experts to find a close estimate of physical values with a number of arbitrary and intangible values whence the estimate would be intelligible and fair to all concerned, it may be agreed that the earnings of certain essential types of public utility should be adequate to yield a due interest on the capital properly invested, to cover maintenance and renewals, to meet operating and other expenses, to yield a profit, and to return some portion of the capital invested where the life of the utility is limited; but this is ideal, and, moreover, in certain unessential cases perhaps more a matter for the speculator than for the user. The application of such ideality must encounter much that is incommensurable, necessitating a form of agreement by the use of various expedients which may be comprehensively designated by such an expression as "give and take" or the word "compromise."

The theme which revives familiar considerations and difficulties does not lend itself absolutely to the principle of generalisation, and subject to individual circumstances the writer is not prepared to support in their entirety the tenets and premises indicated, nor, by the way, is he inclined to acquiesce in the unqualified assertion that the service rendered by or the output of any public utility does not deteriorate as the result of ageing of the plant, even assuming the consideration of a well-maintained plant showing no deferred maintenance. To some readers the value of the mathematical demonstration of the deficiency of ordinary formulæ on page 92 and succeeding pages would be enhanced by exemplification.

The term rate base, it may be added, is defined as any sum to which a rate of interest is applied in determining the interest increment that should be covered by the earnings, the author's natural rate base being interpreted as the amount legitimately invested in the undertaking undiminished by depreciation.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.

Central Station and Tramway Officials.—On June 23rd, at the offices of the Guernsey Electric Light & Power Co., Ltd., a farewell presentation was made to Mr. C. W. WESTLAKE, the chief assistant engineer, who has been appointed engineer and manager of the Electricity Supply Co., Newbury. Mr. R. N. Rye made the presentation, which consisted of a pair of handsome bronze figure ornaments mounted on onyx bases.

The Colchester T.C. has decided to increase the salary of the tramways manager by £50 a year.

Sunderland Corporation Electricity Committee, having had referred back to it by the T.C. a recommendation that the resignation of Mr. J. M. DONKIN, chief clerk in the electricity department, be accepted, has again decided to recommend the acceptance of the resignation—with regret—and with this addition: that he be thanked for his past services, and be paid three months' salary in recognition thereof. With reference to the statements made at the last meeting of the Council as to the actions of the general manager (Mr. A. S. Blackman), the committee record their opinion that in dealing with the staff and workmen he has acted in the best interests of the Corporation, that the whole of the changes made have been fully justified by the circumstances, and the committee have every confidence in Mr. Blackman for the efficient management of the department.

Mrs. Furness, wife of Mr. CHARLES FURNESS, borough electrical engineer at Blackpool, was taken seriously ill while on a visit to Sheffield.

At last week's meeting of the Swansea Corporation Electricity Committee, Ald. Alex. Sinclair (chairman) presiding, the question of the salary of the borough electrical engineer (Mr. W. J. BURR) again came up for consideration. Under the formula of the Association of Municipal Electrical Engineers, the Swansea salary should be £1,050, as against £700 at present. Councillor Daniel Jones said that when the Council referred the matter back at the last meeting it had in mind the general resolution that all applications for increased salaries by the chief officials be deferred for a year. It was also questioned whether the Ministry of Labour had the power to make an award if the scale was not accepted. The chairman said that in the London area the matter had been referred to arbitration, and the award was being awaited. He had no doubt that that award would have to apply to the whole country. Coun. S. Davies suggested that the matter be deferred pending the result of that arbitration. After much discussion, during which Mr. Burr's skill and responsible position were admitted it was resolved to recommend the Council to grant the scale of the Association which, said Coun. A. Ball, was merely a camouflage for a trade union, and unless the scale was accepted there would be a strike.

Mr. GEORGE BROADHURST, of Basingstoke, having taken up his appointment as electrical engineer and manager to the Clacton-on-Sea Council, it is requested that all communications should be addressed to him at the Electricity Works, Old Road, Clacton. Mr. Everitt is not now connected with the undertaking.

General.—At the University of Manchester's degree day, last week, the honorary degree of D.Sc. was conferred upon Prof. J. C. MCLENNAN, Prof. of Physics, Toronto University, and scientific adviser to the Admiralty; and on Sir R. THRELFALL, K.B.E., F.R.S. The degree of M.Sc. (Tech.) was conferred upon Mr. H. C. MENSFORTH, C.B.E., Mr. A. P. M. FLEMING, C.B.E., and Mr. S. L. PEARCE, C.B.E., as already announced.

Mr. ALLEN E. GOODHUE has been elected managing director of the Consolidated Pneumatic Tool Co., Ltd., with office at 170, Piccadilly, London. The works are in Fraserburgh, Scotland. Mr. Goodhue will also have charge of European sales for the Chicago Pneumatic Tool Co. He was for a number of years connected with the sales department of the Midvale Steel and Ordnance Companies in Philadelphia, Chicago, and Boston, leaving in March, 1918, to enter the service of the Government. From that time until January 1st, 1919, when he became connected with the Chicago Pneumatic Tool Co., he was assistant manager of the Steel and Raw Material Section, Production Division, of the Emergency Fleet Corporation.

Warrant Telegraphist W. H. PALK has been appointed to the light cruiser *Carysfort*, selected to proceed to the China station, and Warrant Telegraphist A. DEAN has been appointed to the depôt ship *Tamar*, Hong-Kong, for service at the wireless telegraphy station, Singapore, where he will be in charge. Mr. H. BLANDEN, of the naval wireless telegraphy department, has been appointed to the depôt ship *Tamar* for charge of the wireless station at Hong-Kong.

Lieutenant J. CLARKE, London Electrical Engineers, has been restored to the establishment of the corps.

Captain and Acting-Major C. B. GRACE, A.M.I.E.E., Kent Fortress Royal Engineers (Electric Lights Company), has relinquished his acting field rank on ceasing to be employed.

Lieutenant and Acting-Captain A. P. ISARD, A.M.I.M.E.E., Kent Fortress R.E. (Electric Lights Company) has relinquished his acting rank on ceasing to be employed.

Lieutenant A. WOODS, R.E., Territorial Force, has relinquished his temporary rank of captain on ceasing to be employed as an instructor at the Electrical Lighting School. Lieutenant Woods holds his commission in the Tyne Electrical Engineers, which he joined in 1915, and was given the acting rank of captain this time last year whilst acting as an instructor at the Electrical School.

The directors of the Dublin United (Electric) Tramways Co., Ltd., after placing on record their sense of the irreparable loss sustained by the death of Mr. WM. M. MURPHY, have elected the Right Hon. L. A. WALDRON, P.C., as chairman in his place. Dr. WM. LOMBARD MURPHY, son of the deceased chairman, has been appointed a director.

On the evening of July 2nd, at the Holborn Restaurant, Prof. Miles Walker, D.Sc., Professor of Electrotechnology of the Manchester University, presided over a distinguished assembly of the past and present Westinghouse colleagues of Lieut. Sir A. W. BROWN, K.B.E., one of the heroes of the

Atlantic flight, at a reception and complimentary dinner in his honour. The company was received by Prof. Walker. The toast of the evening was proposed by Mr. W. W. Blunt, the sales director of the British Westinghouse Co., who briefly outlined Sir Arthur Brown's connection with that company from the time he joined in 1902 as an apprentice up to his leaving in 1915 to join the air service as an observer. The speaker then recounted Sir Arthur's fall behind the German lines in France, his capture and eventual repatriation in broken health, his further study in the Air Service where he won both wings as a Pilot, up to his final success with Capt. Sir John Alcock in crossing the Atlantic at the first attempt on June 14th-15th, 1919. The toast was received with great enthusiasm and musical honours. Sir Arthur Brown, acknowledged the toast in a few well-chosen words. The next toast, that to Capt. Sir John Alcock, K.B.E., D.S.C., Sir Arthur's companion in the great adventure, who was also present, was proposed by another Westinghouse apprentice and fellow pilot in the Air Service, viz., Major S. V. Sippé, D.S.O., the hero of the Fredrichshaven raid. In acknowledging the toast, Sir John Alcock said that his one regret was that he, too, was not a Westinghouse man, but only "a Manchester lad." Sir Arthur Brown was presented by Prof. Miles Walker on behalf of Sir Arthur's many Westinghouse and ex-Westinghouse colleagues, with a handsome silver tea and coffee service and also a pair of vases and inkstand to match, of gilt on oxydised nickel. Sir Arthur suitably acknowledged the gifts on behalf of himself and his fiancée, Miss Kennedy. A further toast, that of "Our other guests," was proposed by Mr. D. N. Dunlop, who coupled therewith the names of Major Saunders and Miss Eileen Kennedy, and this was suitably acknowledged by Major Saunders. Mr. L. S. Richardson acted as hon. secretary and organised the function, and Messrs. H. S. Aspinal, P. F. Crinks, J. Horne, and L. R. Morshead gave whole-hearted assistance.

Mr. H. C. Davies, electrician in charge of the South Wales works, and Richard Thomas Mills, Llanelly, has been presented with a silver watch by his fellow workmen on leaving to take up a similar position at Guildford, Surrey.

Messrs. Veritys, Ltd., of Birmingham, have appointed Captain H. Hooper, A.M.I.E.E., manager of their Midland area. Before the war Captain Hooper was with the City of Birmingham Electric Supply Department, and joined the Forces early in 1915. He served in the R.E. in France, being severely wounded. After recovery he held for 18 months a position as Staff Captain to the Chief Electrical Engineer, Air Ministry, resigning this to take up his present appointment.

On Tuesday evening at the Royal Automobile Club the members of the Weekly Newspaper and Periodical Proprietors' Association gave a dinner in honour of their chairman, Sir George Riddell, Bart. The event was arranged for the express purpose of showing appreciation of the manner in which Sir George had championed the cause of the weekly Press during the past year or two when innumerable difficulties of a quite extraordinary kind have had to be faced. The Association is not one that comes very much before the general public, but its membership is of a very substantial character, including the principal British engineering, electrical and other technical publications. Mr. G. J. Maddick, the vice-chairman of the Association, who presided over a distinguished company, presented Sir George, on behalf of the members, with a valuable lacquered cabinet and a silver inkstand. The proceedings provided additional testimony to the great popularity which Sir George Riddell enjoys among the responsible heads connected with our periodical press.

Lieut. B. Sleath (O.C. 4th and 16th E.M.R.U.'s) was mentioned in General Allenby's latest dispatch for services in connection with the operations in Palestine last September. Before the war Mr. Sleath was one of the representatives of Chamberlain & Hookham, Ltd., and he hopes to resume his duties and be calling upon his friends again very shortly.

Roll of Honour.—Lance-Corporal A. N. Anderson, Scottish Rifles, who is reported dead after being missing since March 23rd, 1918, was previously an electrician with Messrs. Stewart and Lloyd, Ltd., of Uddingston, near Hamilton.

Will.—The late Mr. A. C. Reyrolle, of Messrs. A. Reyrolle & Co., left £16,102.

NEW COMPANIES REGISTERED.

Challenge Manufacturing Co., Ltd. (156,249).—Private company. Registered June 20th. Capital, £5,000 in £1 shares. Manufacturers of and dealers in sparking plugs and cycle and motor components and accessories, electricians, engineers, &c. The subscribers (each with one share) are: F. A. Johnson, Aldergate, Alder Lane, Berkswell, manufacturer; F. A. L. Johnson, Aldergate, Alder Lane, Berkswell, manufacturer. The first directors are: F. A. Johnson, F. A. L. Johnson and C. E. Johnson. Solicitor: F. B. Darling, 38, Waterloo Street, Birmingham.

Ventiheta (United Kingdom), Ltd. (156,435).—Registered June 26th. Capital, £165,000 in 150,000 preference shares of £1 each (entitled to 10 per cent. cum. dividend and one-fourth of the surplus profits) and 300,000 shares of 1s. each. To enter into agreement with Ventiheta, Ltd., for the purchase of the patent rights for the United Kingdom relating to an invention for heating and ventilating. Directors: Sir E. Smith, J.P., Royal London House, Finsbury Square, E.C.2; A. M. Clark, 70, Westbourne Terrace, W.2, chairman; Col. H. Fludyer, C.V.O., 62, Warwick Square, S.W.1; H. J. Hardy, 3, York Street, Manchester, director of Hardy, Naufal & Co., Ltd.; F. C. Simpson, 109, St. Martin's Lane, W.C.2, director of Finners Hall (Austin Friars), Ltd. Minimum cash subscription seven shares. Solicitors: Ashurst, Morris, Crisp & Co., 17, Throgmorton Avenue, E.C.

Westlake Bulb Machine Syndicate, Ltd. (156,679).—Private company. Registered July 3rd. Capital, £60,000 in £1 shares. The objects are:—To enter into an agreement with the Metropolitan Carriage, Wagon and Finance Co., Ltd., and the General Electric Co., Ltd., and to carry on the business of electrical and general engineers, manufacturers of machines, apparatus, furnaces and tools for the manufacture of glass, glass bulbs for electric lamps, bottles, glass vessels for vacuum flasks, and other glass articles, manufacturers of and dealers in such glass bulbs, bottles, vessels and goods, &c. The subscribers (each with one share) are: J. Y. Fletcher, 21, De Vere Gardens, W.8, director of General Electric Co.; Ernest V. Hiley, K.B.E., Beechfield, Edgbaston, Birmingham. The first directors are: H. Walker (representing the Metropolitan Carriage, Wagon and Finance Co., Ltd.) and J. Y. Fletcher (representing the General Electric Co., Ltd.). Registered office: 51, Lincoln's Inn Fields, W.C.

Fredk. Hodgson & Co., Ltd. (156,515).—Private company. Registered June 28th. Capital, £2,000 in £1 shares. To acquire the business of electrical and manufacturing engineers, lighting and power specialists and contractors carried on by H. Hodgson at 24, Queen Victoria Street, London, under similar style. The subscribers (each with one share) are:—F. Hodgson, 26, Kempley Road, Hampstead, N.W.3, engineer; G. D. Blatchford, 11, Mafeking Avenue, East Ham, electrician. Directors: F. Hodgson, G. D. Blatchford and R. Tweedy Smith, 80, Chancery Lane, W.C., or his nominee. Registered office: 24, Queen Victoria Street, E.C.

Enfield Ediswan Cable Works, Ltd.—Licensed to acquire undertaking of Enfield Electric Cable Manufacturing Co.—The Enfield Ediswan Cable Works, Ltd., has been registered at Somerset House as a "private" company by Messrs. Cecil J. Rawlinson & Son, solicitors, 47, New Broad Street, E.C., with a nominal capital of £200,000 in £1 shares. The objects are: To enter into an agreement between the Enfield Electric Cable Manufacturing Co., Ltd., and its liquidator of the first part, Viscount Grimston, G. A. Andrews and G. F. Plutte of the second part and the company of the third part, for the acquisition of the assets and undertaking of the said Enfield Co., and a further agreement with the Edison Swan Electric Co., Ltd., to carry on the business of manufacturers and general merchants, engineers, patentees and agents, either by wholesale or retail, and in particular the business of manufacturers of and dealers in wires, cables and all other articles and accessories for the electrical and allied trades, to manufacture and deal in mechanical, scientific and other goods relating to electric wires and cables, &c. The acquisition by this company of the undertaking of the Enfield Electric Cable Manufacturing Co., Ltd. (the books and documents of which have been liable to inspection under Section 2 of the Trading with the Enemy Act) is authorised by the Board of Trade. The subscribers to the memorandum of association (each signing for one share) are: Ralph P. Ashton, Beechwood, Reigate, East India merchant; George J. Andrews, Riverstone, Upper John Street, Helensburgh, Scotland, engineer. Shares numbered 1 to 103,000 inclusive, which are to be issued pursuant to the first-mentioned agreement for purchase, together with any shares which may be allotted to holders of such shares in respect thereof under the provision of the articles of association, are to be known as Group "A," and shares 103,001 to 153,000 inclusive, together with any shares which may be allotted to holders of such shares, are to be known as Group "B." (Probably these provisions as to further allotments refer to a clause in the articles to the effect, subject to a direction to the contrary that may be given by a resolution sanctioning an increase of share capital, all new shares shall, before issue, be offered to the registered members, as nearly as may be in proportion to their existing holdings.) The number of directors is not to be less than three nor more than eight. The first directors are: Viscount Grimston, Sir Ralph P. Ashton, George J. Andrews, John Aspin and A. V. Downton, as nominees of Group "A," and Charles J. Ford and Charles E. Hunter as nominees of Group "B." The holders for the time being of the shares in Group "A" are entitled to six nominees and the holders of those in Group "B" to two nominees on the board. Each director, other than a managing director, a technical director, the chairman or the deputy chairman, is to receive for his services £150 per annum, and the chairman £500 per annum and the deputy chairman £250 per annum, with such further sums as are mentioned below or as may be from time to time be voted by the company in general meeting. J. Aspin is the managing director and A. V. Downton the first technical director. The qualification of a director is one share. The profits available for dividend are to be applied as follows: (1) In payment of a dividend up to 6 per cent. on the ordinary shares (all the original shares are ordinary. (2) Subject to payment of the said dividend in payment of the commissions following, viz.: to the general manager 10 per cent. to the managing director 7½ per cent., to the technical director 5 per cent., to the chairman 4½ per cent., and to each other director 2 per cent. of the net profits after deducting therefrom the said 6 per cent. dividend. (3) The ultimate residue to be applied as further dividend on the ordinary shares or placed to reserve or otherwise as may be decided by the company in general meeting. "A" shares may be transferred by a member or other persons entitled to transfer to any member holding shares in the same group selected by the transferor. A share may be transferred to a relative of a retiring or deceased member; but otherwise no share may be transferred to a person who is not a member so long as any member is willing to purchase the same at the "fair value" (to be fixed from time to time by resolution of the company). The registered office is at Central House, Finsbury Square, E.C.2.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Barbados Electric Supply Corporation, Ltd. (104,367).—Capital, £60,000 in 40,000 preference and participating and 20,000 ordinary shares of £1 each. Return dated January 3rd, 1919. 35,172 preference and 20,000 ordinary shares taken up. £34,672 paid on 34,672 preference. £20,500 considered as paid (being £1 on each of 20,000 ordinary shares and 500 preference shares). Mortgages and charges, £12,000.

Banbury and District Electric Supply Co., Ltd.—Capital, £25,000 in £10 shares. Return dated May 29th, 1919. All shares taken up. £25,000 paid. Mortgages and charges, £5,000.

Lithanode, Ltd.—Charge on moneys due in respect of a Government contract, registered June 10th, 1919, to secure all moneys due or to become due from company to Barclays Bank.

Hewson Manufacturing Co., Ltd.—Satisfaction in full, registered June 12th, 1919, of charge for £1,000 registered July, 1903.

CITY NOTES.

Crompton & Co., Ltd.

The annual meeting was held on July 4th at Salisbury House, E.C. Mr. A. A. Campbell Swinton, F.R.S., who presided, said that the accounts quite justified the forecast which he made at the meeting in February. Taking the asset side of the balance sheet the item of freehold land and premises, plant, tools, &c., showed a

reduction upon the previous figures owing to the fact that their capital expenditure during the year had only been light, and had been more than counterbalanced by the depreciation that had been written off certain small realisations. Stock-in-trade and work in progress had increased from £155,000 to £195,000. That, of course, was partially due to the general increase in prices, but was also an indication of the larger turnover that they were doing. Sundry debtors were also slightly up. Naturally, the more business they did the more money they were likely to have owing to them. There was practically no change in their investments, but cash at the bank showed a satisfactory increase from £4,698 to £18,283. A new item which appeared was that of £16,396, being the expenses of the debenture issue. Turning to the debit side of the account the share capital now amounted to £500,000, having been increased in accordance with the resolution passed at the last meeting. So far the issued capital remained as it did at the date of the last balance sheet. The debenture issue was now £150,000 as against £100,000; £20,000 of those debentures were lodged with the Treasury against the loan they obtained from them. The reserve fund was now £30,500 as compared with £15,500. Creditors were up from £68,000 to £105,000, due partially to the increased turnover, but principally to the provision they had made for the excess profits tax. When the accounts were made up to March, 1918, the liability of the company for excess profits tax was not settled, and they carried forward £61,549 on that occasion, subject to war taxation for the three years. They had got off more lightly than they anticipated, having finally settled with the authorities for £35,520. That settlement gave them sufficient data to enable them to provide in the present accounts for this year's tax, so that they were able to present net figures of the available profit. After making provision for the tax and all other charges, including depreciation, they had as the result of the year's working an available balance of profit of £38,828. The corresponding figure for the previous year in round figures was £27,000. This evidenced the increased earning power of the business. During the second half of the year under review, the period since the armistice, their profits had been favourably affected by the reduction in special war work and the increase in output of their standard machines. There was a feeling abroad that large profits had been made out of war work, but they were making better profits since the war ceased. With regard to the outlook for the present year, the demand for their manufactures was still increasing, and though their output was steadily going up they were unable to accept all the business offered them. New extensions of the works on an extensive scale were in hand, which they hoped would be ready by the latter part of the year, although they might experience some difficulty in obtaining some of the machine tools that they required. There was a great difficulty in finding houses for their workmen at Chelmsford, and that was a matter which they hoped the local authority would take in hand. During the year they had purchased an additional 23 acres of land adjoining their works, which would sooner or later be needed for extensions. They must keep pace with the growing demand that existed for their manufactures or else they would disappoint their customers and risk losing some of them. He thought they were justified in looking forward to a prosperous and profitable year. Their relations with their workpeople continued to be quite satisfactory, and the offer of preference shares to their employés, which he dealt with at the last meeting, had been well received, and applications were coming in both from the workmen and from members of the staff. The larger dividend they were now paying would no doubt help to facilitate the process. The business had now been established for nearly 40 years, and the board had under consideration the establishment of some form of staff pension scheme. Proceeding to refer to the question of new capital and to the offer made by Sir W. G. Armstrong, Whitworth & Co., Ltd., to subscribe for 250,000 £1 ordinary shares, Mr. Swinton said that at the last meeting he went fully into the reasons why the capital should be increased, and a resolution was carried increasing it from £221,007 to £500,000. £24,000 was to be in new preference shares, to be reserved for the employés, and the balance of £254,993 was to be in £1 ordinary shares. Messrs. Armstrong's offer was to subscribe for 250,000 of those ordinary shares at par, and the only condition they had made was that if their offer was accepted two of their directors should be added to the board. The directors had accepted the offer, being convinced that it was a favourable one to the company; but only subject to the approval of the shareholders. Having enumerated the advantages which were likely to accrue to the company from being associated with Messrs. Armstrong's, he said that the new directors whom they were proposing to nominate were Mr. Saxon Noble, who had been a director of Armstrong's for many years, and Sir Glyn Hamilton West, who had also been associated with the company for a considerable period. No commission or brokerage would be paid on the transaction. The proposal was that Messrs. Armstrong should immediately pay up 5s. per share and the balance as required, and of course the shares would rank for dividend simply from the dates at which the payments of the instalments were made.

Col. J. Clibborn seconded the motion, which, after a short discussion, was carried.

A resolution was subsequently agreed to unanimously approving of the arrangement with Messrs. Armstrong.

Chile Telephone Co., Ltd.

During the year ended March, 1919, the number of subscribers at all centres increased by 1,331 to 16,751. The gross revenue advanced by £22,962 to £236,102. The total expenditure (exclusive of income tax and excess profits duty) increased by £24,766 to £153,953. The net revenue from all sources fell by £1,804 to £82,149. The balance to credit of net revenue, after deducting income tax and excess profits duty, and including £24,289 brought forward, is £66,876. Interim dividend 3s., free of tax; final dividend 3s., free of tax. General reserve £16,964. Reserve for renewal of plant, £15,000. Balance forward subject to excess profits duty, £8,510. The rate of exchange fluctuated violently during the year, the highest quotation being 17 5-16d. and the lowest 9d. The average, however, was 13¼d., approximately the same as for the preceding twelve months. The sight rate on March 31st, 1918, was 15¼d., as compared with 9¼d. on March 31st, 1919. The difference on converting the liquid assets and liabilities in Chile at the latter figure was £19,339, from which has been deducted the amount standing to the credit of the Exchange Adjustment Account, £12,375, leaving £6,964, which has been charged to general reserve account

Callender's Cable & Construction Co., Ltd.

The annual meeting was held on July 3rd at River Plate House, E.C. Sir J. Fortescue Flannery, Bt., M.P., who presided, first referred to the death of Mr. James Callender, son of the founder of the company, and brother of the managing director, who, he said, for so many years gave the whole of his valuable services to the company with such splendid results. They also, he said, had to regret the death of Mr. W. Roberts, their agent and business manager in Bombay. Passing on to deal with the report, the Chairman said that the company's work for the country in the production of war material ceased quite suddenly upon the signing of the armistice. The company gave practically the whole of its services to the Government during the war period in the production of war material, and on the conclusion of the armistice they were faced with the problem of returning to their ordinary peace work. The management had made most extraordinary strides in that direction during the past six months, and he might claim for them an amount of foresight and pre-arrangement to deal with the situation, which was most creditable to them. Since the armistice they had made surprising progress in renewing their ordinary commercial work. During the war their works, both in Lancashire and at Erith, had been expanded considerably, and new plant costing a very large sum had been bought and put to work. Much of that plant was quite unsuitable for peace requirements, and they had to get rid of a large proportion. In addition to extensions, they actually built new works at Erith, which were called the Picardy works. Those were put up at the urgent request of the Government, and they were mainly occupied upon producing telephone cable for field use. The whole of the plant in those works was quite unsuitable for peace manufactures, but they were adapting the buildings to their ordinary commercial requirements. They had received letters of thanks from the Admiralty, the War Office and other Government departments acknowledging the services which the company had rendered to the country. The scientific branch of their organisation had been very busy during the war. Many problems arose which had to be solved by experiment and research, and they possessed laboratories and an experimental department which were second to none in the electrical trade, which made most valuable discoveries upon the problems that were put to them by the Government in time of war, and some of those discoveries would be useful to the company in the future. Many improvements had been made in details, and perhaps the most prominent was the fact that they were now beginning to manufacture cable of an extremely high voltage, which would be an economy to those who used it, and which if it proved to be as successful as they anticipated, would make a great change in the use of electricity throughout the world and increase the demand for electrical apparatus for most practical commercial purposes. The obvious advantage of that supervoltage cable was so clear that already they had more demands for it than they could meet, and they had booked large orders of a very satisfactory character. They had had many difficulties to contend with arising out of the war conditions. The question of transit was as difficult as ever, and he was hopeful that the new Ministry of Transport would be a very valuable help to commercial people like themselves in organising and co-ordinating the whole of the transport services of the country. The prices of raw material showed little signs of being reduced, and they must pass on those increases to their customers in a fair and equitable manner. Perhaps the greatest difficulty of all was the great increase in wages. The question of international competition was the one which would govern wages in this country, especially in trades like theirs, far more than any supposed greed of gain upon the part of employers and shareholders. They had to compete with foreign countries such as Japan and China, where labour was exceedingly cheap, and America, where the diligence of the workers was assisted very much by their sense of the spirit of competition. The continuous use of

machinery by shifts and the desire on the part of the workers to give some return for their increased remuneration would be the salvation of this country as a manufacturing country. By using their plant in shifts they took a larger amount of service out of capital invested, and that, along with a sense on the part of the workers that they and the employers together, were competing with other workers and employers in other countries, would, he hoped, continue Britain in the first rank among the manufacturing centres of the world, both in electrical and other matters. The business of the Anchor Cable Co. had been extraordinarily successful in regard to its large output for war services. Proceeding to refer to the accounts, he said that the issue of preference and ordinary shares which was made last year was subscribed eleven times over, which showed the confidence of the public in the company. The amount to the credit of profit and loss was £134,000 as against £121,000 a year ago. The appropriation for depreciation of buildings, plant and machinery had increased from £17,000 in 1917 to £37,000 last year; and they had an available balance of £184,000 as against £180,000 in the previous year. The total capital issued was now £800,000 as compared with £375,000. The reserve was £100,000, as compared with £250,000, the difference being accounted for by the shares which had been issued to the shareholders. On the asset side of the balance sheet they had £522,000 of stock, compared with £365,000 in 1917. On repairs and maintenance of plant they spent £30,000 last year, as compared with £24,000 in 1917. In conclusion, he referred to the war services of the company's employés, and remarked that 817 men joined the Forces, of whom no fewer than 16 received promotions and decorations, while no less than 66 had laid down their lives for the country.

Sir T. O. CALLENDER, J.P. (managing director), in seconding the motion, after paying a tribute to the work of his late brother in connection with the company, said that during the war they had done a lot of important work for the Admiralty in connection with the submarine warfare, and he wished to thank the staff for their zealous services. He expressed satisfaction that they were getting clear of the control which the Government had exercised on the supply of various materials. Of all the difficulties which they had had that, he said, was one of the greatest. They realised that those restrictions were necessary during the war, but now that things were different they were anxious as soon as possible to get rid of Government control entirely, because they were quite convinced that no commercial business could be carried on efficiently when it was under direct Government control or interference. For the first two months after the armistice things were very unsettled in the factories, but since then the horizon had cleared to a very large extent. Those who hesitated to place orders or make contracts had now learned that the situation was clear, and that they could go ahead, and the difficulty now was not in obtaining contracts but in making satisfactory arrangements for their execution. They had a large amount of work in hand, and a still larger amount in front of them. The Government Electricity Bill, if carried, would mean a large increase of work, and they were making arrangements for dealing with the situation. They were extending their plant and getting ready for that super-tension work which was going to make a considerable difference to the industry. They were finding that the heavy expenses, which for many years past had been lavished in the research department, was now bringing forward most fruitful results, and would in the near future pay them over and over again. There was every indication that in the time in front of them there would be a very large amount of work to be done, and he was confident that the company would at least get its fair share. He was sorry to say that they had had a good deal of trouble with labour, and they were in certain respects still in trouble. When the 47-hour week was introduced pledges were given that additional energy would be put into the work and that the shorter hours would be compensated by increased activity, so that the output would not be impaired. Those pledges had not been fulfilled in some departments. He was pleased to say that as far as their cable hands were concerned they had little to ask beyond what they got from them. Every month they noticed a distinct improvement in the output of the factory, and their relations with the men were of the best. On the other hand, their engineering department was not so satisfactory. They were suffering as most employers in the engineering trade were suffering: from a greatly diminished output. Their men worked the 47 hours, and nothing more was given to the company; no acceleration of output took place, and as a result they were behindhand with their engineering work, and it cost them more than it should. That position gave the management great anxiety, because they had to meet competition from Japan in particular, where already they found that the competition in some branches of their business was a matter of serious moment. They were also looking for competition from the United States, and when one considered that a considerable portion of their business would depend upon work which came to them from overseas, they were exceedingly sorry that the engineering department had not risen to the occasion, but was simply plodding along, and that they had not followed the example set by the cable branch, where things were as satisfactory as they were unsatisfactory in the engineering department.

The report was adopted without discussion.

British Electric Traction Co., Ltd.

The annual meeting was held on July 3rd at the Manchester Hotel, Aldersgate Street, E.C. Mr. E. Garcke, in moving the adoption of the report, said that 2,831 of the company's employés joined the Forces, of whom 203 gave their lives in the war. From an operating point of view the problems they had to deal with during 1918 were probably more difficult and anxious than any other set of problems ever before experienced. In pre-war days their chief problem was how to encourage the public to use their services at remunerative rates; but in 1918 the problem was how to handle the increased volume of business in excess of their ordinary facilities. They had a revenue of £12,308 more than for the preceding year, and the expenses were £8,205 more. Of the latter increase £5,000 was represented by income tax. The circumstances were still far from normal, and the directors were unanimously of opinion that the time had not come yet when it would be prudent to increase the dividend. The prospects for the current year were good in some respects, but uncertain in other directions. The traffics were keeping up, but the demand for electricity in connection with munitions work had fallen off abruptly, and that for industrial and domestic requirements was recovering slowly. It was certain that the expenses would show a still further increase; the 48-hour week had been in force since April; its effect in relation to revenue could not yet be determined, and they did not know what coal would cost them next winter. Proceeding to refer to the allied undertakings in which the company was interested, he said that negotiations were pending for the sale of the undertaking in Auckland, New Zealand, to the local authority there, and an option had been given to the City to purchase it. With regard to the Oldham, Ashton and Hyde undertaking the local authorities had given notice to purchase the same under the 43rd section of the Tramways Act. The arbitration had not yet been fixed, and meanwhile they were continuing the working of the undertaking. Some time ago negotiations were begun for an extension of the tenure of the Potteries Company's concession. In the meantime they had been approached by the Corporation of Stoke-on-Trent with a view to the purchase by agreement of the undertaking. At Sheerness the company now only had the electricity supply business, which was developing. Since the closing of the books the Wellingborough electricity undertaking had been amalgamated with the Electricity Supply Co., Northampton, and they had been paid out in cash. As showing the trend of the business, Mr. Garcke proceeded to give some aggregate figures concerning the public utility services of the company—the operation of tramways and light railways, the working of motor omnibuses, and the supply of electricity—omitting the statistics of the London companies, which, he said, required separate treatment. Their gross receipts on the tramways and light railways were £1,500,000, showing an increase over the preceding year of £200,000 or 15.4 per cent. The average fare was 1.35d. per passenger, showing an increase of less than one-tenth of a penny per passenger. About half the increase in the year's revenue was due to the larger number of passengers and the other half to the small increase of fares. In the case of motor omnibuses, the gross receipts were £530,000, an increase of £117,000 or about 28 per cent. Here again the larger revenue was due partly to more passengers and partly to increased fares. In the electricity supply department the gross receipts were £368,000, showing an increase of £80,000. The units sold showed an increase of about 10 per cent., and the average price charged was 16 per cent. higher than the average price of the preceding year. Those figures showed that in the past year they had done a larger volume of work at slightly increased prices. Taking the three departments together, their gross receipts were £2,400,000, an increase over the preceding year of £400,000, or 20 per cent. In regard to the expenses, taking them in the aggregate for the three departments, they were £1,600,000, showing an increase of £283,000, or 21 per cent. The balance or gross profit was £793,000, an increase of 16 per cent. These figures showed conclusively that the business was a progressive one, and that if they could make fair charges for the services they rendered it was a moderately profitable business. The amounts set aside for renewals might seem large, but during the war it had been impossible to get the labour and material for the necessary works of renovation, and even now those scarcities were so great and the prices so high that much of the work had to be deferred. The results of the working of the London companies for the past year had again been disappointing, for they had had no dividend for the past year on their shares—not even on the cumulative preference shares—in the London and Suburban Traction Co. If the London figures were included in the general statistics of results which he had given them, they would only strengthen the good case they could make that the fares and electricity charges were inadequate. The reasons for the poor results shown by the London companies in comparison with the results shown by the provincial companies could not be explained in a few words. The situation was very complex. Put briefly, the bad results were due chiefly to increase of expenses. In the case of the North Metropolitan Electric Power Supply Co., owing chiefly to the large rise in the price of coal, no dividend could be paid on the ordinary shares for 1918, compared with 10 per cent. paid in 1917. The Metropolitan Electric Tramways Co. had been able to increase some of the fares, and it was hoped the results for this year

would show some improvement. The London United Tramways Co. had been permitted by the Board of Trade to make some increase of fares up to 1d. per mile. An encouraging feature of the situation was that plans for reducing the wasteful competition between the tramways and the services of the L.G.O.C. were now on the point of completion. The question of fares on tramways and omnibuses and of charges for electricity had always been the vital factor of their business. They might economise in every possible way and they might increase the efficiency of their administration to the utmost possible extent, but the efforts which they might make in those directions could only inadequately compensate for the depreciation in the purchasing value of the penny when applied to the payment of wages and the purchase of materials. Since the war the costs of labour and materials had on the average more than doubled, and they had not been able to make anything like a proportionate increase in their charges. In that respect they were in an entirely different position from that of every other business. Their prices were limited by statute, and, in some cases, they were practically unable to charge even the authorised rates, because of public opinion and the pressure from local authorities. During the war when this situation became exceedingly difficult, the Government departments promised their assistance, but the Statutory Charges Act which was passed last year for the purpose of affording electric supply, tramway and other statutory undertakings some relief from the burden of war conditions, authorised in the case of companies only a temporary increase in the maximum rates of charge, sufficient to make good only three-quarters of their pre-war ordinary dividend, and then only in those cases where a reduced profit to that extent could be shown to be due to the war. Local authorities, on the other hand, were better treated under the Act, and might obtain power to increase fares to an extent sufficient to meet their interest and sinking fund charges. It seemed extraordinary that people who, in ordinary commercial affairs, accepted as an axiom the principle that increased cost of production must find expression in increased price, would not accept that principle when it was applied to public utility undertakings in the hands of private enterprise. It did not seem to be sufficiently recognised that there were physical limitations to the available transport services and that many months must elapse and considerable capital expenditure be incurred before they could be augmented. The electric power house, permanent way, rolling stock, were all designed to deal with a given volume of traffic, and if this was exceeded by reason of exceptional conditions, there was absolutely no way of immediately satisfying the increased demand. The provision of increased travelling facilities in order to avoid overcrowding entailed large expenditure on new works, rolling stock, &c. Had the critics of public service companies considered how this fresh expenditure could be provided? At present the capital invested in those undertakings was not adequately remunerated. The average return on the whole of the capital of about £160,000,000 invested in electric traction companies was only 3¼ per cent., and on the proportion of capital represented by ordinary stock it was only about 1¾ per cent. Improved public services could only be provided by private enterprise when it was recognised that there must be a fair deal between the public who used the services and the undertakers who provided them. The chairman then referred at some length to the Ways and Communications Bill, which, he said, affected their tramways, light railways, and omnibus undertakings; and the Electricity (Supply) Bill, which affected their various electric lighting and power undertakings. The Ways and Communications Bill contained some very desirable provisions in regard to the co-ordination of Government control. Instead of tramways, light railways, and omnibus undertakings being under the control, as at present, of several separate Government departments, all matters affecting those industries would, if the Bill became law, be under the authority of one Ministry. That was an improvement in Government organisation which they had reasons to appreciate highly. But the new Ministry took over not only the existing powers of various departments; it also acquired new and additional powers of a wholly unprecedented character, and whether that would tend to an improvement or otherwise was entirely a question of the spirit in which the important functions were performed. The Bill gave autocratic powers to the Ministry for two years, at least, to control and manage tramways and other road traffic (among other services), and to establish new services as it thought fit. The Minister would be able to improve, alter, impede, or destroy any of the undertakings which he controlled, and there would be no appeal against his decision. The owners of transport enterprises might be required to submit their property to the arbitrary control of a Government department. Whether that would be for the benefit or detriment of the owners it was impossible for anyone to say. The only certainty about the situation was the uncertainty of the results of the proposed legislation. One noteworthy provision of the Bill which showed the trend of present-day legislation was that tramways belonging to local authorities were excluded from the operations of the Bill. Turning to the Electricity (Supply) Bill, the point of immediate importance was the question of the terms upon which it was suggested that the generating stations should be purchased by the District Boards. The Bill provided that the price to be paid should be the cost of construction less depreciation. In most cases that would not be as favourable as the terms under which the companies at present held their rights, and in the case of electric power supply companies, the terms suggested in the Bill were altogether inadmissible. A power company received its rights in perpetuity, because it had to be compensated by long tenure for the obligation it undertook to develop the business during the first years at great cost without profit. This Bill gave no compensation whatever for past losses, nor for disturbance, nor for the sacrifice of future gains. They were to bear the loss where there had been depreciation in value of the plant, but they were not to have the benefit of any appreciation in value of the business which they had built up and carried on with inadequate return. Some of their undertakings which had not perpetual rights were not purchasable under the present Acts and Orders for many years, but under the Bill the contemplated District Boards would be empowered to take the heart out of an undertaking on the terms he had mentioned, and with regard to the remaining distribution system they would be left in an unsatisfactory position because, not having control of their own heart, they would not be able to regulate their activities. Therefore, they said the District Boards should not be empowered to buy part of their undertaking without buying the whole, and the purchase price should not be less favourable than that to which they were entitled under their present rights, and they should receive reasonable compensation for anticipating the date of purchase. The existing legislation was none too favourable to private enterprise as was officially admitted, and they had reasonable grounds for expecting amelioration of the terms; but the proposed legislation, whatever might be its effects on the organisation and development of the industry, certainly did not attempt to improve the position of investors. Private enterprise men did not ask to be spoon-fed, but they saw a tendency to exclude them from the meal they had helped to produce, and they said that such treatment was neither fair to them nor encouraging to further enterprise of the same kind. The serious thing for the country was that a breach of a Parliamentary bargain made with a particular industry affected prejudicially not only that industry alone, but undermined the confidence of all other industries that might be similarly affected. All sections of the community should be able to look to their Government for that measure of protection which was compatible with the general interests. They were not making destructive criticisms of the Bill without at the same time offering constructive suggestions. The private enterprise interests in the industry were practically unanimous in advising the Government to limit legislation to the appointment of Commissioners, who were qualified to examine the facts of each particular case, and advise the parties concerned and Parliament as to the best steps to be taken. They were strongly convinced that owing to the complexity of the technical, administrative, and financial problems, it would be found altogether impracticable to deal with the situation by means of District Boards composed of local authorities, consumers, labour, and private enterprise, as proposed by the Bill. Each case should be separately considered on its merits by some impartial authority, capable of applying general experience to individual cases. The electrical legislation of the past had produced complexities which could not be disentangled by a rigid and uniform scheme for the whole country. The ideal way of dealing with the situation would be to make a new start on a clean slate, but as that was constitutionally impossible, the only sound and logical way was to produce a consistent system by evolutionary methods based on wide experience. That could be accomplished by a qualified and permanent Board of Commissioners picking up the threads one by one, unravelling the knots, and gradually producing order out of chaos. While it was his duty to warn them of the rocks ahead, he had no desire to alarm them unnecessarily. The important question at the moment was whether the Government could be persuaded to give the matter reconsideration. They would not relax their efforts to obtain necessary amendments in the Electricity Bill, and they were entitled to hope that amendments would be made. The Home Secretary, in introducing the Bill on second reading, May 14th, testified to the good work done by the companies, and gave assurances of the Government's attitude of wishing that fair play should be given to them, and that the services rendered by them as pioneers of the industry in face of great difficulties should be recognised. He said the Government "is anxious to avoid as far as possible anything like a reflection upon those who have been the pioneers of electricity and anything like a hardship upon those to whom really is due the development that has already been made." The Bill as framed was not reconcilable with those sentiments. The spirit of the Bill was not the mind in the speech. He could not believe that the Home Secretary expressing those views would not be open to the conviction that the Bill must be amended. He could give them another good reason for his confidence that the Government would alter the Bill when its full meaning was understood. The Chancellor of the Exchequer, the other day, when he invited city men to subscribe to the new loan, said: "The greatest asset of the British Government is its good faith. . . . He would sooner go a little beyond the bond than have any people say that the British Government had dealt sharply with them, and had failed to carry out the expectations which it had raised." With those assurances from members of the Government, they could rely that injustice would not be done. Therefore while they must leave no stone unturned, and they wanted

the help of the shareholders to get their representations considered, he asked them not to be alarmed. If, however, they failed in their efforts to obtain reasonable amendments, while they would be bitterly disappointed they would not be discouraged, for the resources of enterprise would not be exhausted. They would find fresh fields and pastures new. They would, of course, have to adjust their organisation to the changed conditions, but change provided opportunities for enterprise, and with the large financial resources they commanded, and the efficient organisation for doing work which they had developed, he did not despair of the ability of the company, with its wide experience, to find suitable and fruitful fields for its activities. The all-important thing at this juncture was that they should clearly understand the difficulties with which they were confronted, and meet them judiciously with courage and hopefulness.

Mr. P. D. Tuckett, in seconding the motion, remarked that they were passing through a period of intense difficulty—a transition period, but provided they were fairly treated by the governing authorities—and his own feeling was that in the interests of the public whom they served they eventually would be fairly treated—with the increased prosperity of the working classes, who were their principal customers as far as transit were concerned, and with the prospect there was for the development of the electric supply industry which undoubtedly was now coming into its own, they might look forward with confidence to the future. He had reason to believe that the American Government were considering whether public utility companies ought not to be put in a position as a matter of right to call upon the controlling authority to authorise them to grant rates sufficient to enable them to secure a minimum return upon the capital which had been properly expended in the undertakings. Similarly in this country he thought it would be essential before long for Parliament to recognise that if the working man was entitled to a minimum wage, capital equally must have its minimum return if fresh money was to be found to provide the services which the public required.

The report was adopted.

French Companies.

The Société des Cables de Lyon, after writing off £29,000 for depreciation, reports net profits of £13,000 for 1918, permitting of the payment of a dividend of £2 per share.

The Société d'Electro-Chimie reports net profits of £62,000 for 1918, as compared with £50,000 in the preceding year. It is intended to pay a dividend at the same rate as in 1917, namely, £2 per share.

The Société d'Electro-Chimie de Bozel reports net profits of £40,600 for 1918, as compared with £40,000 in the preceding year. The dividend in 1917 was 17s. 7d. per share, which rate is expected to be maintained for last year.

The Société Anonyme Westinghouse reports gross profits of £91,000 for 1918, as contrasted with £162,000 in the previous year, and net profits of £106,000 and £129,000 in the two years respectively, inclusive of the balance brought forward. It is intended to pay a dividend of 6s. 4.8d. per share on the capital of £640,000.

The accounts of the *Société Industrielle des Telephones* show gross profits amounting to £339,000 for the year ended June 30th, 1918, as compared with £373,000 in the preceding year. After allocating £100,000 to depreciation, the net profits total £168,000, and the directors recommend a dividend of £1 12s. per share on a share capital of £720,000, being the same rate as in 1916-17.

The Société Anonyme Westinghouse reports gross profits of £35,000 for 1918, or practically the same as in the preceding year, the balance available for disposal rising to £75,000 with the inclusion of the amount brought forward. The directors recommend the payment of a dividend of £1 per share, whereas no distribution was made for 1917.

The report of the *Société Electro-Chimique de Giffre* for 1918 refers to the necessity for an amalgamation of the works in France in order to meet foreign competition. The directors had entered into conversation with other companies with a view to the establishment of a closer connection, and a scheme of fusion with these companies would be presented to the shareholders before long. The gross profits amounted to £53,000, and a dividend at the rate of £2 1s. 7d. per share has been declared on the old capital and £1 0s. 9d. per share on the new shares.

The Compagnie Francaise Thomson-Houston reports gross profits of £877,000 for 1918, as compared with £455,000 in the preceding year, the large increase being due to the absorption of the Société d'Eclairage Electrique and the general development of business. After deducting general expenses, interest charges, &c., setting aside £127,000 for depreciation, the net profits are returned at £369,000. It is proposed to pay a dividend at the rate of £1 12s. per share, both on the old and new shares, being the same rate as in 1917, but in order to do this the premium realised on the new shares has had to be drawn upon to the extent of £59,000.

The directors of the *Ateliers de Constructions Electriques du Nord et de l'Est (Jeumont)*, reporting to the shareholders at the meeting held on June 14th, stated that the Jeumont works had been operated by the Germans for the enemy army during the whole period of the occupation. When the company resumed possession after the departure of the enemy it was found that the buildings on the whole were in good condition, but that considerable quantities of raw materials, manufactures, and machine tools had been removed. The rolling mill, for instance, together with the wire mill and the cable factory having been almost entirely cleared of their plant. The foundries were intact in so far as the buildings were concerned, but an overhead traveller and a portion of the plant and patterns had been carried away, as also had a large number of the machine tools in the big machine shop. Work was being partly resumed at the foundry. The directors were taking steps to secure the return from Germany of the plant which could be identified. The large works established at Plaine Saint-Denis in 1917 for the construction of all kinds of machines had enabled the company to await the resumption of activity at the Jeumont works. It was necessary under the circumstances again to postpone the submission of balance sheet and profit and loss accounts.

German Companies.

The directors of the *Elektrizitats A.G. Concordia, of Cologne*, recommend the payment of a dividend of 10 per cent. for 1918, as contrasted with 12 per cent. in the previous year.

The A.G. Mix & Genest, of Berlin-Schoneberg, reports for 1918 only a small surplus, which merely serves for making provision for depreciation. The unfavourable result is attributed chiefly to the decline in the bulk production of munitions, the result of the war, and the devastating effects caused to the general situation by the revolution. Two war dividends of 18 per cent. have been paid, and a rate of 15 per cent. was distributed for 1917 on a larger amount of share capital.

The report of the *Akkumulatoren Fabrik A.G., of Berlin and Hagen*, whose dividend at the rate of 20 per cent. for 1918, as against 25 per cent. in 1917, has already been announced, shows that the net profits amounted to £148,000, as compared with £126,000 in the preceding year. It was possible to arrange with battery owners for a wartime increase in the charges for maintenance under existing contracts, but material losses were incurred under this heading, and a similar state of affairs was expected for 1919, notwithstanding the larger income from this source.

The Ges. fur Elektrische Unternehmungen, of Berlin, which was interested in the Société Financière de Transports et d'Entreprises Industrielles, of Brussels, to the extent of nominally £200,000, is reported to have succeeded in disposing of this investment to neutrals at a profit, and the result is the recommendation of an increase in the dividend from 5 per cent. in 1917 to 6 per cent. last year. The net profits amounted to £224,000, as compared with £185,000 in 1917. It is stated that as a result of the disposal of the Belgian interests, and the large provision made for depreciation, no losses can take place on the company's foreign investments in the future.

The Land und Seekabelwerke A.G., of Cologne-Nippes, report that notwithstanding the cancellation of large contracts for purely Army purposes, the orders brought over from 1918 were sufficient to provide adequate work for the present, and the further development would depend upon the course taken by the political situation. Having allotted £26,000 to the depreciation account, as compared with £19,000 in 1917, the net profits are returned at £41,000, as against £37,000 in 1917. The directors recommend a dividend at the rate of 12 per cent. on share capital of £300,000, this contrasting with the same rate on less capital in the previous year.

The report for 1918 of *Julius Pintsch, A.G., of Berlin*, states that the transition from war to peace manufactures had proceeded without particular interruption. Notwithstanding the possession of a large stock of orders, it was impossible to foresee what the future prospects of peace manufacturing would be. Indications, however, were increasing that neutral countries were disposed to place their orders preferably with Allied countries than with German firms, despite the higher prices, as doubts were entertained concerning the efficiency of German industry, particularly in regard to the uncertainty of the time for delivery being maintained. After writing off £93,000 for depreciation, as against £51,000 in 1917, the amounts exhibit net profits of £94,000, as compared with £134,000. It is intended to pay a dividend at the rate of 10 per cent., as contrasted with 14 per cent. in 1917.

Stock Exchange Notice.—The following are to be officially quoted:—

Electric Construction Co., Ltd.—75,800 ordinary shares of £1 each, fully paid (Nos. 224,201 to 300,000).

Anglo-Portuguese Telephone Co., Ltd.—A further dividend of 3 per cent., less tax, making 6 per cent. for the year, is recommended in the annual report. £10,000 is put to renewals fund and £8,207 carried forward.

Wemyss & District Tramways Co.—In respect of 1918, a further dividend of 6 per cent. on the ordinary is announced, making 10 per cent. for the year, less tax. An extra 1¼ per cent. is payable on the 6 per cent. preference shares, and £3,000 is put to reserve, leaving £1,046 to carry forward.

Calcutta Electric Supply Corporation, Ltd.—Units sold to consumers during five weeks ended May 30th, 1919, 3,332,149, compared with 3,297,451 units in the corresponding five weeks of 1918.

Eastern Extension, Australasia & China Telegraph Co., Ltd.—Interim dividend for the three months ended March, 3s. per share, free of income tax.

Gravesend & Northfleet Electric Tramways Co., Ltd.—Dividend, 3 per cent.; to reserve, £1,000; forward, £1,737.

Veritys, Ltd.—The directors announce a dividend of 7 per cent. per annum (7s. per share) on preferred ordinary shares for half-year, making 7 per cent. for year; £1,000 to reserve against debts; £2,769 for depreciation.—*Financial Times.*

Anglo-American Telegraph Co., Ltd.—Interim dividend for the quarter ended June 30th of 15s. per cent. on the ordinary stock and £1 10s. per cent. on the preferred stock, less tax.

Edmundsons' Electricity Corporation, Ltd.—Year ended March, 1919. Total available profit £18,765. Cum. preference dividend £12,000; carried forward, £6,765.

Bell Telephone Co., of Canada.—Quarterly dividend of 2 per cent., less tax.

STOCKS AND SHARES.

TUESDAY EVENING.

THE last week of the new Loan Campaign has brought, as it was expected to do, a certain amount of dullness in Stock Exchange markets, but the result of the Loan as a whole has been surprisingly slight, seeing how urgently it appeals to patriotism and the pocket. So far as the electricity section is concerned, the main feature is still the weakness in the shares of the London supply group. It is pretty generally agreed that the depression of the past fortnight is largely due to the vigorous methods employed in opposing the Government's Electric Supply Bill. Holders of shares have been frightened by the language used in some of the circulars sent out by the companies, and the protestors might perhaps have been well advised to word their appeals rather less forcibly. The Midland Electric Corporation for Power Distribution circularised its proprietors with reference to the Bill stating that if this Bill becomes law in the form in which it has been introduced in the House "this company, in which you have invested, may possibly suffer severe loss." So far as price movements are concerned, there is not much quotable change, but the tendency continues heavy, and there is no inducement for buyers to come forward. County of London are a bright exception, with a rise to 10¼, but falls of ⅛ occurred in City Lights, St. James and Westminsters.

Proposed nationalisation of coal, electricity, railways, &c., has its effect upon home railway stocks with the rest. The market is generally heavy. The Underground companies put forward an interesting case before the Select Committee of the House of Commons on the subject of London traffic. It was pointed out that from 1908 to 1913 the average rate of dividend and interest paid by the Tube companies rose from 1.62 to 3.18 per cent. There was a small drop in the first year of the war, but it has since risen a little to 3.59 per cent. The increase in passengers has been colossal. In 1908 the Underground carried 147 million people; in 1918 there were 900 million passengers, and the extraordinary part of the whole thing is that the number increases every month.

Underground Electric Income Bonds at 94½ are ½ down, and the £10 shares have fallen 5s. to 3½. Districts have dropped to 24. No changes have occurred in the other stocks of the Underground lines. In the foreign group, Brazil Tractions have lost a point, and the Mexican utilities are generally rather lower. On the other hand, a dozen or so of the American and Canadian utility companies' bonds and shares have moved upwards, and show gains of one to three points on the week. Most of the certificates are held on the other side of the Atlantic, and movements in prices have little more than academic interest for this country. There is talk, however, of an early re-establishment of an American market in London, which pre-supposes the return of American securities to this side, for obviously there cannot be a market unless there are shares with which to supply it. Shrewd observers are hinting that their Transatlantic cousins will see to it that prices are maintained until, at all events, a market is restarted here.

Abrupt falls in Marconi shares are associated with fears regarding the issue of the company's claim against the Crown. The ordinary came down with a run to 5 3-16 before a rally to 5¼ occurred. Marconi Marines gave way to 3 1-32, Americans to 30s., Canadians to 16s. 6d. From these levels there was a recovery, and while the market remains in a very sensitive state, the respective prices of this trio are 3¼, 31s., and 17s.

The Great Northern Telegraph Company's report is exceptionally interesting by reason of its forecast of post-war conditions as applied to cable concerns. No less than £148,270 profit accrued to the company through exchange, and this has enabled maintenance of the 22 per cent. dividend. The company recently celebrated its 50th birthday, and, in honour of the occasion, it divided £55,555 by way of gratuities amongst the staff, and gave £13,889 to Copenhagen University, the interest on which latter amount is to be applied to research work and development of electro-technical problems.

All cable companies will be affected by the same kind of factors to which the Great Northern report alludes as likely to come into play now that the war is over. Telegraphic codes will be brought in use again, to the shortening of cables and diminishing of receipts. The building of powerful wireless stations is indicated as another way whereby revenue may be lessened. Finally, says the report, it should be taken into account that the conveyance of postal matters by aeroplane is likely to supplant, to a certain extent, short-distance telegraphy. The company is "facing quite novel conditions, and numerous new arrangements will have to be made before the uncertainty which at present prevails as regards the future will have disappeared." As a frank and intelligent statement by the board of a company, the Great Northern report deserves recognition, and, although its service is unique in some respects—especially as it concerns Russia—the broad features are not dissimilar from those which, as already observed, relate to other cable companies.

At 31, Great Northerns are £1 down on the week. West India and Panama ordinary have fallen 1-16. Callender's preference regained 2s. 6d. of the dividend deducted at the end of last month.

It is officially announced that a new company called the Enfield Ediswan Cable Works, Ltd., has been incorporated with a capital of £200,000, divided into as many ordinary shares of £1 each, which has acquired the Enfield Electric Cable Manufacturing Co., Ltd. English Electrics have been down to 26s., but are now rather better. General Electrics at 22½ are 10s. to the good. Ediswan 5 per cent. debentures gained 2 points. Apart from these movements the market for manufacturing shares is quiet, and, if anything, the tendency is a little dull. In the rubber list the price of the produce, at 1s. 9½d. per lb., shows a farthing or so improvement, but business in this market is very slack, and is entirely overshadowed by the excitement in the all-popular oil department.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1917.	Dividend 1918.	Price July 8, 1919.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES					
Brompton Ordinary	10	8	6½	—	£6 1 6
Charing Cross Ordinary	4	4	8	—	6 13 4
do. do. do. 4½ Pref.	4½	4½	8½	—	6 15 4
Chelsea	3	3	8½	—	4 13 4
City of London	8	8	11½	— ¼	6 19 0
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
County of London	7	7	10¼	+ ¼	6 16 3
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	7	6	6½	—	5 5 0
London Electric	Nil	Nil	1½	—	Nil
do. do. 6 per cent. Pref.	6	6	8½	—	7 14 10
Metropolitan	4	6	8	—	8 6 8
do. 4½ per cent. Pref.	4½	4½	6¾xd	—	6 18 8
St. James' and Pall Mall	9	10	6½	— ¼	7 5 6
South London	6	6	8½	—	7 6 6
South Metropolitan Pref.	7	7	10⅛	—	6 18 7
Westminster Ordinary	9	8	8½	— ¼	7 2 8
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	9½	— ¼	6 3 3
do. Def.	1½	33/6	22½	—	7 8 0
Chile Telephone	6	6	7	—	5 14 4
Cuba Sub. Ord.	7	7	11	—	*6 4 5
Eastern Extension	8	8	16	—	*5 6 0
Eastern Tel. Ord.	8	8	16½	—	*4 19 1
Globe Tel. and T. Ord.	7	8	16	—	*5 0 0
do. do. Pref.	6	6	10½	—	5 14 6
Great Northern Tel.	22	22	31	—1	7 2 0
Indo-European	13	13	55	—	5 18 2
Marconi	20	20	6⅜	— ¼	3 11 6
Oriental Telephone Ord.	15	19	24	—	4 9 0
United R. Plate Tel.	8	8	7½xd	—	*5 2 0
West India and Panama	1/3	1/3	1-16	— 1/16	*4 15 6
Western Telegraph	8	8	16½xd	— ¼	*4 16 8
HOME RAILS.					
Central London Ord. Assented	4	4	63½	—	6 6 0
Metropolitan	1	1½	26	—	4 16 6
do. District	Nil	Nil	24	— ½	Nil
Underground Electric Ordinary	Nil	Nil	3½	— ½	Nil
do. do. "A"	Nil	Nil	9⅝	—	Nil
do. do. Income	4	5	94½	— ½	*5 5 0
FOREIGN TRAMS, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	42	—	5 0 4
Anglo-Arg. Trams. First Pref.	5½	Nil	3⅛	— ⅛	—
do. do. 2nd Pref.	—	—	3½	— ⅛	—
do. do. 5 Deb.	5	5	67½	—	7 9 0
Brazil Tractions	—	—	69¾	—1	—
Bombay Electric Pref.	6	6	11¾	—	5 11 7
British Columbia Elec. Ry. Pfce.	5	5	57½xd	—	8 14 8
do. do. Preferred	Nil	2½	46½xd	—	5 7 6
do. do. Deferred	Nil	Nil	44½	—	Nil
do. do. Deb.	4½	4½	61	— ½	6 17 10
Mexico Trams 5 per cent. Bonds	Nil	Nil	61½	—	Nil
do. 6 per cent. Bonds	Nil	Nil	50½	—	Nil
Mexican Light Common	Nil	Nil	37	—1	Nil
do. Pref.	Nil	Nil	51	—	Nil
do. 1st Bonds	Nil	Nil	64½	— ½	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	37	—	8 18 0
British Aluminium Ord.	10	10	14	—	5 14 5
British Insulated Ord.	25	12½	27½	—	5 11 1
British Westinghouse Pref.	7½	9	27½	— ⅛	5 19 0
Callenders	25	25	10½	—	6 3 0
do. 6½ Pref.	5	6½	5⅞	+ ⅛	6 8 10
Castner-Kellner	25	20	2⅞	—	7 5 6
Edison-Swan, "A"	—	—	1½	—	6 6 8
do. do. 5 per cent. Deb.	4	5	76½	+2	6 10 9
Electric Construction	10	10	1⅛	—	8 5 5
Gen. Elec. Pref.	6	6½	10½xd	—	6 3 0
do. Ord.	10	10	22½	+ ½	*4 9 0
Henley	25	25	2⅜	—	5 3 6
do. 6½ Pref.	6½	6½	8½	—	6 0 0
India-Rubber	10	10	17½	—	*5 17 4
Siemens Ord.	—	10	7	—	*7 0 0
Telegraph Con	26	30	35½	—	4 13 6

*Dividends paid free of Income Tax.

THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

(*Concluded from page* 30.)

Valuing and Assessing Electrical Undertakings.

By BAILIE WILLIAM B. SMITH, O.B.E.

(*Abstract.*)

BECAUSE what are known as "public utilities" have come into existence since the principles and methods of valuing and assessing for rating purposes were formed, it seems necessary that now the whole question of valuing and assessing such undertakings should be considered and put on a proper basis, in accordance with modern conditions. Especially is this urgent in the case of electricity, as its whole future position is before Parliament and the country.

Electrical undertakings are about to be grouped into large areas without reference to the limited boundaries of parishes, cities, or even counties, and it seems reasonable that the assessing and valuing of such electricity undertakings should be put on a new and broader basis immediately, otherwise there is sure to be a large amount of uncertainty as to the application of the provisions of the old Acts to the new conditions, and the probability of many actions in the Courts.

The report of the committee appointed by the Board of Trade to consider the question of electric power supply, on which is founded the present Electricity (Supply) Bill, states (paragraph 80):—

"The local rating system as applied to electric transmission mains must greatly and, we think, unjustifiably interfere with the supply of cheap power and enhance its cost. As the use of electricity has come in since the Acts on Valuation and Rating were framed, it seems necessary that they should be revised. Their application to electricity undertakings and appliances should be settled on economically sound principles and clearly defined. The matter is one which calls for the immediate attention of the Government."

An important part of the reconstruction scheme of the Government is the supply of electricity at the lowest possible price; therefore, we must see that such undertakings are fairly valued for rating purposes, and not over-burdened with rating charges, imposed under some obsolete law or principle, not justly applicable to the present circumstances.

In England, a large part of the valuing is still done on the principle laid down by the "Statute of Elizabeth," 43 Elizabeth c. 2. The poor rate is still made by Overseers—even on public utilities—except in parishes which have some local Act, but in all cases the limit of area is the parish.

In Scotland, public utilities, railways, canals, tramways, gas and electricity undertakings are valued by one official, H.M. Assessor of Railways and Canals in Scotland, and we in Scotland prefer that method, as it ensures more uniformity over the country. But, of course, he has to make the valuations in accordance with the directions contained in Acts of Parliament; and these Acts, whether applying to Scotland or England, require thorough revision.

The basis of valuation seems to be the same in both England and Scotland; it is calculated on revenue. "The gross value is the rent at which a property might reasonably be expected to let, taking one year with another," or "the rent which a hypothetical tenant would be willing to pay."

In the case of a public utility such as an electricity undertaking, which is supposed to be let, the letting value is determined by ascertaining the gross revenue, then deducting from it the working and management expenses, maintenance and renewals of mains and works, insurance, &c., which gives what the hypothetical tenant might be supposed to pay for it as rent, and that is taken as the rateable value.

But this method of valuing makes no allowance for any sum set aside as sinking fund, and therefore penalises an undertaking which is keeping itself on a sound financial basis by providing for sinking fund. Mr. Robert Wilson, treasurer of the Glasgow Water Department, in a paper read in 1908, said:—

"By Act of Parliament, the public bodies holding such water works are obliged to set aside as a sinking fund a certain percentage on all borrowed money, and to meet that sinking fund, an additional assessment has to be levied on all consumers of water. This additional assessment is included in the general revenue of the undertaking, and is thus, under the method of valuation before explained, added to the rental in the different parishes, and made liable for local taxation. In other words, they are bound to pay taxation on sums raised to pay off their capital debt.

"That this method of valuation is unsound may be seen at once by supposing the sinking fund to have cleared off the whole debt. The sinking fund would then cease, no interest would be payable, and under the present method of valuation the works would have no taxable annual value."

The Glasgow Corporation Electricity Department has been taxed on £1,655,000 capital debt, paid off by way of sinking fund and depreciation.

I would recommend that a reasonable basis of valuation should be on a profit-earning basis only. In the case of publicly-owned undertakings, the amount paid in interest on borrowed capital, and in the case of companies the amount paid in dividends to shareholders, should be taken as the assessable value. This seems to be equally fair in both cases.

The other part of the problem is how to make a fair allocation of the assessment among the various parishes in the area containing the undertaking. In Scotland that is done in water, gas, and electricity undertakings, by dividing the amount among the various parishes in which the undertaking is, or through which it passes, in proportion to the capital expenditure in each parish, no difference being made between a revenue-producing parish and one producing no revenue. This seems a grossly unfair method, and in a scheme of linking-up by either underground or overhead cables, would impose an expenditure in rates that cannot be justified.

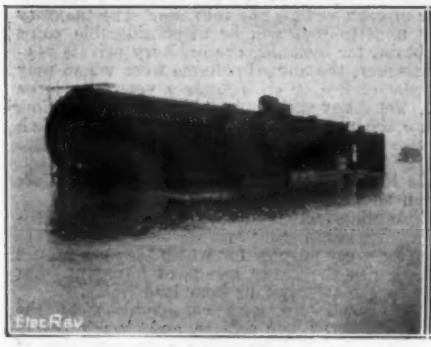
Another anomaly is that where the water main passes through a burgh it is rated on only one-fourth of its value; and this provision also applies to tramways, gas pipes and electricity mains.

An electricity undertaking might lay down a large and expensive cable between two or more stations as a stand-by, to be used only in case of a break-down or other emergency, yet, if valued and allocated on the line of its original cost, it would have to pay the same amount of assessments on it as if it were in constant use and helping to produce a large revenue.

If electricity mains and cables are to be treated in this manner, it will add appreciably to the cost of current, and it does not appear to be right to saddle the undertakings with such charges, when we are trying all possible means to reduce the cost to the lowest minimum.

It might be reasonable to consider what has been recommended for canals and light railways, as applicable to the areas through which mains and cables pass, that they should not be assessed for any local rate at a higher value than that at which the land occupied by the railway would have been assessed, if it had remained in the condition in which it was immediately before it was acquired for the purpose of the railway.

One might go further and say that as public roads are not rateable, mains and cables laid in these roads should not be rated. They are public utilities, and in that position involve no additional expense. When they are being constructed all damage done to the road must be made good. Under-



GERMAN SUBMARINE LIFTER.

ELECTRIC VEHICLE AT IPSWICH.

A SEAPLANE ON THE SLIPWAY.

These snapshots, for which we are indebted to Mr. Arch. J. Howard, A.M.I.E.E., borough electrical engineer, Taunton, represent scenes typical of the lighter side of the three days of the Convention.

ground sewers have not been rated, but now an attempt is being made to assess them.

There will be difficulty also with valuing and rating overhead wires.

If electricity is to be applied to all railways, to agriculture, to small towns and village industries, and to be spread over the country generally, as contemplated in the Board of Trade Committee's report, very large use must be made of overhead wires, both for main transmission and distribution in outlying areas, and if they are to be burdened with rates, or to be the subject of litigation, it will be a great hindrance to development. Overhead wires would not interfere with the land under them in many cases. Therefore, when so placed why should they be rated at all?

Another thing that may seriously affect the extended use of electric power is the rating of machinery. Hitherto, motors in consumers' premises have not been rated, but certain assessors now are of the opinion that they should be considered as "machines or plant for producing or transmitting first motive power." If that view were adopted, a manufacturer driving his factory by electricity would be paying twice the amount of assessment per H.P. as compared with one using steam.

Assessments would be charged first on the boilers and steam plant, and thereafter on the cables conveying the electrical energy to the factory; and the amount of these assessments would be charged to the consumer in the price per unit he pays for the current. Then they would again be charged on the machinery in the factory for changing the electricity back into power and applying it to his machines. But in a steam driven factory, assessments would be charged only on the boilers, engine and main driving shaft.

This double imposition of taxation could be prevented by the insertion of a clause stating exactly what was to be considered as "machines or plant for producing and transmitting first motive power," and what should be excluded from that definition.

Various Royal Commissions have been appointed to inquire into valuation and taxation, and they have produced elaborate reports, but so far there seems no suggestion of action being taken, and the subject is not mentioned in connection with reconstruction.

DISCUSSION.

Ald. JEPHCOTT said that electricity supply undertakings were taxed out of all proportion to the work done on behalf of the community; the Act of Elizabeth *must* be out of date, and there were many anomalies that should be set right. He moved that the council be instructed to take what action was necessary to bring before Parliament the importance of dealing with this question. A large amount of the profits of the Birmingham electricity department had been absorbed in taxation. As the author had shown, the basis of rating was unfair.

Another speaker seconded the motion, and pointed out that if cost price was the basis, as it was now 2½ times the pre-war cost, the taxation would be correspondingly burdensome in the fierce competition with gas undertakings, which were laid out at pre-war costs. Electricity undertakings ought to be taxed much less heavily in the future than in the past. The cost would have to be passed on to the econsumer, who would not know what he was paying to the rates.

Clr. PEARCE (Dewsbury), a member of the Gas and Electricity Committees, and an overseer as well, asked who would suffer if the basis of taxation were altered. Some would say that the manufacturers were benefiting at the expense of the poor, and of the tradespeople. The time was ripe for revision, but all-round revision, not for electricity supply alone.

A Councillor, as an overseer and a member of the Assessment Committee, said that it was within his experience that no one, not even experts, understood rating. His committee had had to consult most eminent legal advisers, but the money was wasted. Hardly two electricity works were rated on the same basis, and few knew on what basis they were rated. Radical alterations were necessary. The money did not go back to the parishes from which it was derived, and a fair allocation of rating was required.

Clr. BROWN said that he would support revision for all purposes, but not for electricity supply alone. The statement that works would be rated on 2½ times pre-war costs was quite misleading; special circumstances were always taken into account. The division of imperial and local taxation ought to be revised. A professional man earning a large income was taxed as a householder, while a business man paid a hundred times as much in rates.

Clr. PEETE said that the obvious defects should be remedied. All the Commissions agreed that something ought to be done, but all Governments agreed to do nothing. He did not approve of the profit-earning basis; they should be rated on tangible assets, arriving at the "annual value" by taking a percentage on the market value as a basis, as in the case of household property.

Ald. SMITH did not agree that manufacturers would benefit as much as was alleged. Power supply must be cheap. He had no desire to favour electricity, but called for revision of the system.

The resolution was amended to cover the assessment and valuing of public utilities generally, and was unanimously adopted.

The Electric Vehicle Committee of Great Britain.

The annual report for the year ended March 31st, 1919, states that during the period two additional members have been co-opted, namely, Mr. J. A. Popplewell, representing the Electromobile Co. (Leeds), Ltd., and Lieut.-Col. F. Garrett, representing Messrs. R. Garrett & Sons, Ltd., of Leiston, while one representative, Mr. A. E. Meaden, of Wolseley Motors Ltd., resigned for the reason that his firm were no longer interested in electric vehicles.

A very large number of inquiries for information and advice has been dealt with, and the committee's services were taken advantage of by the French Government at the most critical period connected with the petrol situation, in supplying information in regard to electric vehicles for civilian motor transport for French towns and cities.

The committee's publication, the *Electric Vehicle*, has continued to gain in popularity and circulation, and has now reached the stage of becoming a remunerative property. Its success became so well established that the committee decided to venture on a monthly, in place of a quarterly issue when the war ended, and the monthly issue will commence from June, 1919.

The committee is still far from satisfied with the use made of the journal by electric supply undertakings. Many undertakings are not even taking single copies of each issue. Many other undertakings are assiduously circulating copies of each issue among prospective users, with exceedingly gratifying results. Those electric supply authorities, both municipal and company, that are in this matter displaying an apathetic attitude are, without question, neglecting a splendid opportunity of securing a very remunerative class of business, one that can be catered for without any addition to generating plant or mains, and which in its incidence upon the supply load factor is proved to have a most beneficial effect. The regular distribution of the *Electric Vehicle* among carefully selected prospectives involves little trouble and insignificant expense, while the reward, though it may not be immediate, is certain and well worth securing, judged from the value as a current-consuming device of each vehicle put into use. The majority of electric supply undertakings will be at considerable pains and expense to obtain, for instance, the ordinary private residence lighting consumer, the annual revenue from whom may be only of the order of five or six pounds a year in a large number of cases. Yet many such undertakings make no effort whatever to secure the purchase of an electric vehicle which will consume electrical energy to the tune of from £20 to £25 per annum, and this without adding anything to the peak, but enhancing the load factor because taking the supply just during hours when additional output is welcomed.

One of the determining factors in securing cheaper electricity is load factor. In stimulating and encouraging the use of electric vehicles for every purpose for which they are proved to be advantageous, lies the ready means of filling up that night-hour hollow in the twenty-four hour load line.

The Technical Sub-Committee gave consideration to the question whether for light electric vehicles and electric trucks there would be advantage in introducing a 50-amp. size of charging plug and receptacle in addition to the present British Standard 150-amp. fitting. As the result of inquiries the sub-committee reported that the need for the smaller size had not been established.

In regard to nomenclature, the committee issued a recommendation, which had been approved by the Motor Trade Association and the Commercial Motor Users' Association, that the term "Electric Lorry," "Van," or "Wagon," as the case might be, should be used in describing the ordinary road electric vehicle, and that the term "Electric Truck" should apply to the small vehicles used for running about factories, railway stations, docks and similar places.

In regard to financial aid, the list of municipal subscribers is quite a small one, and the committee hopes that in the future it may command more support from the electric supply undertakings than in the past.

The accounts show income £888, expenditure £778, and there is a surplus of assets over liabilities of £431.

The Northrup-Ajax Furnace.—Some additional particulars regarding the construction of the high-frequency induction furnace, described in our issue of Dec. 13th, 1918, which is being developed in America by Dr. E. F. Northrup for the Ajax Metal Co., of Philadelphia, Pa., employing high-frequency currents and dispensing with iron cores, are given by the *Engineer*. The primary winding consists of a number of turns of water-cooled copper tubing surrounding a cylindrical quartz vessel. This vessel contains an inner refractory cylinder holding the melt, the space between the inner and outer cylinder being filled with silica or zirconia sand. An oscillatory current circuit with a discharge gap is used to obtain the high-frequency currents—10,000 to 20,000 cycles per second—and with this system the furnace has so far been studied up to 60 KW. As at present developed, the furnace is particularly suitable for laboratory work for temperatures up to 2,500-2,800 deg. C., as it can be worked under the controlled atmospheric or gaseous conditions required for the production of special alloys. The commercial possibilities of the furnace for large-scale operations depend on the development of less expensive and more efficient means of obtaining high-power currents at 10,000 cycles or more per second.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

The Shakespear Patent Katharometer.

At the Royal Society conversazione last month the katharometer, devised by Dr. G. A. Shakespear, of the University of Birmingham, and manufactured by the Cambridge Scientific Instrument Co., Ltd., was exhibited; it is used for measuring directly the percentage composition of a

Fig. 1.—Hydrogen Purity Meter.

mixture of two gases, such as hydrogen and air. The principle has been applied to instruments for various purposes, *e.g.*, for measuring the purity of hydrogen in airships, determining the permeability to gases of aircraft fabrics, recording

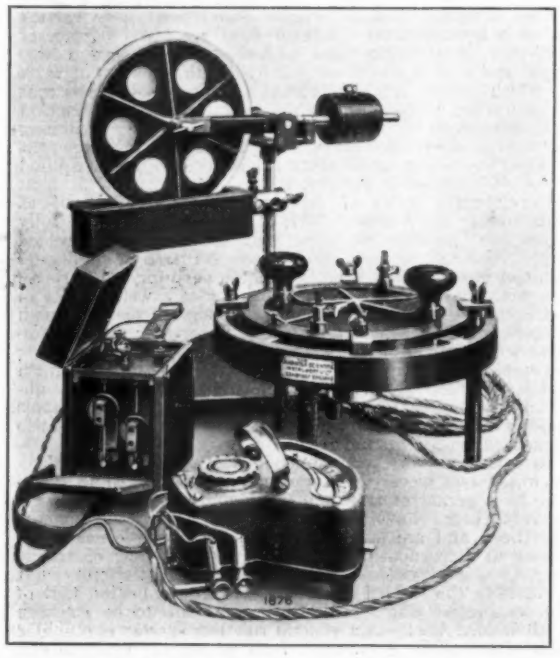


Fig. 2.—Apparatus for Testing the Permeability of Aircraft Fabrics.

atmospheric humidity, &c. The katharometer consists essentially of two identical platinum spirals contained in two cells drilled in a copper block, and connected to form opposite arms of a Wheatstone Bridge. The two cells are filled with the gases under comparison, *e.g.*, one with pure hydrogen and the other with a mixture of hydrogen and air in which it is required to determine the percentage of hydrogen. If a fairly strong current is flowing in the bridge circuit the two platinum spirals will become heated, and each will lose heat by convection to the copper walls of the cell. The rate of cooling and therefore the temperature and resistance of each spiral will depend on the physical constants of the gas in the cell. The spiral, in a cell containing pure hydrogen, for example, would cool more rapidly than one in a cell containing a mixture of hydrogen and air, so that the resistance of the first wire would be less than that of the second. The difference in the resistances of the two spirals caused by the unequal rates of cooling throws the Wheatstone Bridge out of balance, the extent of the resulting deflection of the galvanometer being dependent on the difference in the rates of cooling—*i.e.*, on the difference in the composition of the gases in the two cells.

Fig. 1 illustrates a hydrogen purity meter, for testing the purity of the gas in balloons or airships, in which the principle of the katharometer is employed. In this instrument one cell of the katharometer is filled with pure dry air and sealed, while gas from the balloon is drawn through the other cell by means of a suction pump. The galvanometer in the Wheatstone Bridge circuit is a double-pivoted moving-coil instrument, with a pointer which moves over a scale graduated in percentages of hydrogen. The percentage of hydrogen in the balloon gas can therefore be read directly on the scale, and by subtracting the reading from 100 the percentage of air can be obtained.

An apparatus for testing the permeability of aircraft fabrics is shown in fig. 2. A circular piece of the fabric under test

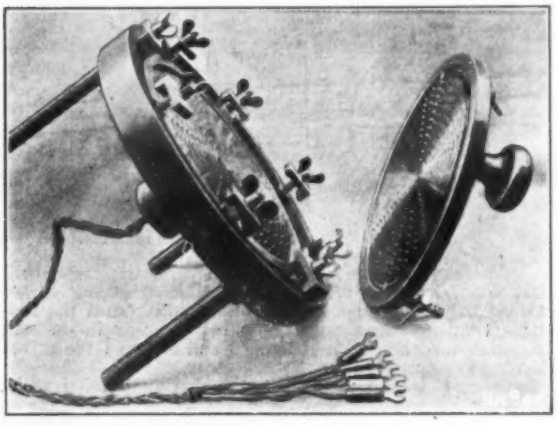


Fig. 3.—Shakespear Permeameter.

is clamped between the base and the top plate of the permeameter, which is shown in greater detail in fig. 3. The base plate and top plate are recessed to form a gas chamber, which is divided into two parts by the fabric, the ridges in the plates preventing the fabric from sagging. Hydrogen is passed through the upper compartment by means of the gas inlets in the top plate, while the lower compartment is filled with clean dry air, after which the inlets into this compartment are sealed up. A katharometer is screwed into the base of the lower compartment and connected to the indicating instrument in which are contained the galvanometer and the remaining coils of the Wheatstone Bridge circuit, and which is calibrated to read directly the percentage purity of the gas in the lower compartment. In this case one cell of the katharometer is filled with pure dry air and sealed, while the other is open to the gas in the lower compartment. This gas, owing to the leakage of hydrogen through the fabric, will be air contaminated by hydrogen, and the permeabilities of different samples of fabric can be compared by comparing the rates at which the hydrogen in the lower compartment becomes mixed with air. The edge of each sample, where it is gripped between the two halves of the permeameter, is coated with wax, and to ensure that the area of the uncoated portion shall be the same in all samples, the wax is applied by means of a dipper, shown at the back of fig. 2, in which the fabric is enclosed between two plates of exactly the area required, and the plates are then rotated so that their edges dip in melted wax, the ring of fabric uncovered by the plates thus becoming coated with a layer of the wax.

Katharometers have also been used to detect leakages of hydrogen through the seams, &c., of balloons and airships. In this case the katharometer, which is connected to the indicator by long flexible leads, is used to explore the surface of the balloon to be tested, and the presence of leaks is

shown by deflections of the galvanometer. Greater sensitivity can be secured by using a reflecting galvanometer instead of the pointer type.

When the katharometer is used as a humidity tester one cell is left open to the atmosphere, while the other is closed by a screwed cap containing phosphorus pentoxide to ensure that the air within it shall always be perfectly dry. To enable a record of changes in humidity to be obtained a recording galvanometer is used in place of the ordinary indicator. The type of recording galvanometer used is that commonly known as the thread recorder, in which the pointer of a suspended coil galvanometer is automatically depressed once every minute or half minute on to a thread impregnated with ink, which passes above the surface of a revolving drum carrying a chart. By this means the thread is pressed by the pointer against the chart and a dot is made which records the position of the pointer at that moment. The succession of dots so made forms a record of the varying positions of the pointer, and the charts can be calibrated in terms of humidity.

The "Lettgo" Mechanical Overload Release.

The "Lettgo" release, as the name implies, is a device which will automatically disengage the driving power from the driven machinery if the load exceeds a predetermined amount, thus allowing the driving motor to run free without friction in the release. The release will, it is claimed, take care of an overload gradually, as well as suddenly applied; it can also be set so that it will not trip out with sudden jars, or shocks, such as are received in a crusher or shearing machine. The device is made symmetrical, and can be assembled to operate in either direction. The springs have a means of adjusting the tension so that the release will operate at the proper load, and the proper factor of safety is always maintained, no matter how often it operates.

Fig. 4 shows the "Lettgo" mechanical overload release as built to be applied to the driving gears of a typical endless chain bucket conveyor installation for handling coal.

In the illustration (fig. 4) the spider A keyed to the shaft B has triggers C pivotally mounted on link D with the ends engaging inside notches in the rim of the drum F and roller K in the spider A; springs E regulated to any desired pressure by

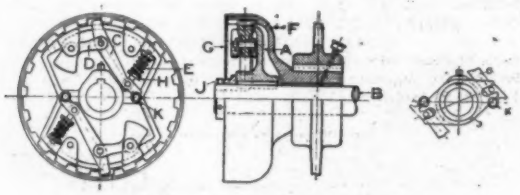


FIG. 4.—THE "LETTGO" OVERLOAD RELEASE.

the adjusting nuts H hold the ends of the triggers on the roller K under normal conditions, but when the drive is overstrained the compression of the springs will permit the ends of the trigger to drop into the position shown in the cut, releasing connection with the rim F and allowing the driven machine to stop.

To set the driving triggers in the driving position again, the collar J is provided, having fingers which engage pins on the lower ends of triggers C. By turning this collar by means of a spanner, the triggers will be moved to the original position, and the outer ends will at the same time enter notches in the drum F, thus renewing the transmission connection.

A cover G fitting the end of the drum F protects the entire mechanism, which can be packed with grease. The hub of drum F may be extended to receive wheel or gear, and have a bushing for running loose on the shaft, or may be keyed directly to a separate shaft, thus forming a coupling device, in which either element may be the driver.

The above form of release in four different sizes is being manufactured by the Link Belt Co., of Chicago. It has been patented by FRANK E. AURAND, 123, So. Cuyler Ave., Oak Park, Ill.

The Swedish Telephone Industry.—*Sv. Dagbl.* for May 26th stated that Allmänna Telefonaktiebolaget L. M. Ericsson, which is an amalgamation of Stockholms Allmänna Telefonaktiebolag and A. B. L. M. Ericsson & Co., reports for 1918 a net profit of Kr. 3·74 mill., and distributes a dividend of 6 per cent. Competition from Anglo-Saxon industrial countries has greatly increased, threatening the Swedish export industry in a way that makes it necessary greatly to reduce the costs of production. Concerning the branch companies, the report states that Russische Aktiengesellschaft L. M. Ericsson & Co. in Petrograd, had to close in March, 1918, and dismiss the workers. The British L. M. Ericsson Manufacturing Co., in London, has been fully occupied and shows good results. The dividend for 1918 is 10 per cent. "Ericsson," in Vienna, and "Ericsson," Budapest, have also been fully employed, except for a short interval of stagnation. These companies pay dividends of 7 and 12 per cent. respectively. Ericsson Manufacturing Co., in Buffalo, has been doing very well, and proposes a distribution of 10 per cent. From the Société des Téléphones Ericsson, in Paris, no report has yet been received, but it is believed the profit will be insignificant.

ELECTRIC WELDING IN WARSHIPS.

By W. H. GARD.

(Abstract of paper read before the INSTITUTION OF NAVAL ARCHITECTS.)

THE author proposes to give some indication of the extent to which it has been possible to adopt electric welding in warship construction, and shortly to explain what is the scope of its present and possible future usefulness, and the directions in which efforts may justly be made in the attempt to get the most out of it. Subsequent remarks will assume the use of the coated metal electrode. The problem relates to the usual materials employed in the structure of warships and the prospect of combining these materials into a satisfactory seagoing vessel; varying the composition of these materials in order to facilitate their connection by electric welding and improve the quality of the joint has seemed to offer much promise, but nothing can come out of this without the collaboration of the steel maker, which collaboration must follow further research and experiment as to its necessity and extent.

There is no doubt as to the very considerable advantage to be gained by the use of this process; to a shipbuilder it is very attractive, and opens out visions of economy and efficiency.

The following example of a repair will, the author thinks, be admitted by shipbuilders to be a veritable triumph for electric welding: The cast-steel stern-post of a battleship had been damaged to such an extent that the main barrel of the stern-post was cracked right through, and in addition about half-way down to the lower pintle the starboard flange was badly cracked, and it looked as though a long period in dock would have to be faced and a new stern-post fitted, but it was decided to attempt a complete repair with electric welding.

The repairs to the flange were quickly carried out, the defective portion was removed, the space carefully filled in, and a well tapered reinforcement was worked on to the original stern-post. The repair to the upper defect involved the removal of a large quantity of sound metal to trace and eradicate the cracks and to provide a trough or trench of suitable section to enable efficient welding to be carried out. The work was skilfully and thoroughly carried out in a very confined space in the heat of summer. After a total period of about six weeks, some 6 cwt. of metal had been welded into the stern-post and the repair was finished. As the vessel has seen about 21 months' sea service since the work was completed, doubts or misgivings as to the suitability of electric welding for this kind of work have been dispelled.

Similar jobs of somewhat less importance were cast-steel stern of a "P" boat very badly broken—five separate pieces were reassembled, welded together and refitted in place with entirely satisfactory results; the shaft bracket of a large 36-knot destroyer broken through—the repairs were carried out in a few hours at Chatham; and the lower portion of stern-post of a Castle liner broken off—new portion was forged and welded into place at Portsmouth. A class of work for which electric welding appears eminently suitable is that of reinforcing badly worn shell plating. The cost of removal and replacement of worn plates which were beyond patching was estimated at about seven times the cost of reinforcement by electric welding, quite apart from the extra time required in dock for renewing the plates.

An elaborate series of experiments was carried out at Portsmouth in August, 1917, in order to more fully investigate possibilities, the goal being the all-welded ship. Although some highly successful test results were obtained on specimens produced in the shop for the purpose, experience has shown that the efficiency of a welded butt in a ship cannot be estimated from the results of tests on small samples. This conclusion is highly important; shop conditions will admit of perfect welding if really skilled workers are employed, whereas the conditions in the ship are much less favourable. The skill of the welder is the most important factor in the performance, and if the conditions under which a weld is made are not entirely suitable, reliance cannot be placed on the result.

To determine whether a welded joint would be affected by sea-water, test pieces were prepared and subjected to corrosion for a period of twelve months, and afterwards tested—the result being shown in the table, p. 61. These experiments have been and are still being prosecuted with considerable success at Portsmouth. From the point of view of tensile strength a good welded connection is quite satisfactory, but in ductility the welded joint falls a long way behind that of the continuous plate. This feature appears to be common to all welded work—as a general rule less success is obtained with plates above ½ in. thick both as regards strength and ductility, but excellent results are obtainable with plates up to 1 in. in thickness; and further, flat or downward welding is the most easy to carry out, and the results are usually the best with this type of welding. The application of electric welding to new construction would depend upon the extent to which the details could be designed and arranged to ensure the maximum amount of flat welding at the ship, and elimination as far as practicable of the difficult overhead and horizontal welding.

Incidentally, by comparing welded joints with riveted joints, the "slip" of a riveted joint under quite moderate stresses was shown up with considerable prominence. More extensive sources of supply of reliable electrodes appear to be necessary before electric welding can take up its proper position in general engineering and shipbuilding industries.

Corrosion Tests.

Description.	Specimens tested shortly after welding.	Specimens uncoated and exposed to atmosphere for 4 months, then suspended between wind and tide for 8 months.	Specimens coated with one coat of protective and one of anti-fouling composition, and wholly immersed in sea-water 12 months.
Welded lap. Lap 2½ in. wide, light vertical weld along each edge.	At 101 tons weld broke and rivets in lap sheared. Mean width across section of weld, ·19 in.	No visible corrosion. Up to 50 tons no movement. At 87 tons weld broke and rivets in lap sheared.* Mean width across section of weld, ·20 in.	Up to 100 tons no movement. At 129 tons weld broke and rivets in lap sheared. Mean width across section of weld, ·23 in.
Welded butt. Butt welded on flat, strapped at back. Edges of strap caulked.	Up to 60 tons no movement. At 117 tons plate broke through line of rivets.	Up to 100 tons no movement. At 144 tons plate and weld broke.	At 139 tons weld broke and rivets in lap sheared.

* This result, being less than the original result, was probably due to stress not being uniformly divided between the two welds of the lap, and not to corrosion.

A few experiments have been carried out as to the practicability of forging electrically welded connections. There is no indication that electric welding produces a "hot shortness."

Some samples of good and inferior welds by varying makers of electrodes have been subjected to microscopical examination, to trace the relation between the physical properties and their structure, which lead to the opinion that fracture was due to flaws, and the experiments revealed no connection between the microstructure and the physical properties of the weld; the skill of the welder was the predominating factor in successful welding.

At an early stage in the progress of the experiments referred to, it was decided to weld portions of the bulge structure fitted to one of H.M. vessels. It was thought that there would be no gain in welding any of the non-watertight portions of the work. The combination of widely spaced rivets and welding, which was adopted for the watertight portions, did not interfere with the present practice of erection and of efficiently closing the work. A lap with a single row of widely spaced rivets welded on both edges is superior in strength to any riveted connection in common use, and 75 to 90 per cent. of the riveting and drilling would be saved according as the connection is compared with the double or treble riveted buttstraps.

The experiments clearly show that the introduction of widely spaced rivets had no effects on the strength of the joint, the whole of the strength being derived from the weld; these structures would have been equally strong had the riveting been omitted altogether. The plating was arranged on the clinker system, so as to make the outside weld, which is relied upon for watertightness, a downward weld. The water test showed that this course was justified. In a subsequent vessel the raised and sunken system was adopted and the results were not so satisfactory, as the overhead welding involved a much greater strain on the operators. It was found comparatively easy to train an operator to make a single run of overhead welding, but a great deal of training was necessary to enable successive runs to be added to the first run satisfactorily.

Welding can be successfully applied to structural work if there is sufficient time to give the various details full consideration. Whether this hybrid type of construction merely marks a transition stage it is difficult to say, but with our present experience it is certain that before this transition is complete a considerable amount of research work will be necessary concerning the many variants. Occasional failures in the Royal Dockyards have mostly occurred with butt-welded joints. Conditions at the time did not permit of the causes of failure being more fully investigated.

Attempts have been made to weld defective butts and straps in ships' oil tanks without conspicuous success, probably owing to the presence of oil and red lead, whilst the welding caused adjacent rivets to leak. In these cases the added metal was found so hard as to be almost uncaulkable. It is desirable to avoid the use of rivets if it is wished to ensure the success of a welded joint, rivets in such a joint, if only for the purpose of closing the work, tend to decrease the efficiency of the joint. Experience showed that resistances and other accessories supplied were but ill adapted for rough usage at the ship, and much more robust fittings are essential.

On the experience to date, it has been agreed with certain builders to work on lines pursued at the dockyards as a preliminary to enable them to acquire a skilled staff of welders, so as to be ready for a further advance. At present neither designers, draughtsmen, workers, nor shipyard appliances are sufficiently advanced or educated in the matter to embark on any extensive application of electric welding to naval architecture. Recommendations for further development will receive every encouragement. It has been customary to await proposals from firms, and no attempt has been made to force the pace, as failure would lead to a want of confidence in the process.

There is a big field for usefully employing electric welding for fittings where the maximum seagoing stresses can be fully represented, either by a practical test or testing machine, and in these cases we would encourage any proposal to use electric welding as a substitute for forging or casting as the case may be. In this connection an 18-in. torpedo tube has been electrically welded and tested without showing any sign of weakness or flaws, and an extension of this process for the purpose is under consideration.

It may be argued that we are justified, in view of the labour-saving possibilities of electric welding, in proceeding at a much faster pace, but these opinions are based upon a considerable amount of experience, and until the difficulties of erection without angles or rivets, and properly closing work, have been overcome, and a close study has been made of the means to be adopted for proceeding with the work as expeditiously and efficiently as with the customary processes, we hesitate to commit ourselves to accepting. The process has not reached the stage where it can be specified by the naval architect, as full reliance upon the results produced by the average shipyard worker cannot be expected at present.

THE NATIONAL PHYSICAL LABORATORY.

Chief of the institutions which helped so much to smash the Germans' reputation as the pre-eminent material scientists is the National Physical Laboratory at Teddington, where on Tuesday afternoon, June 24th, Sir J. J. Thomson, President of the Royal Society and chairman of the board, welcomed a large number of visitors, the occasion being the annual inspection of the laboratory. Sir Richard T. Glazebrook, director of the Institution, and his staff conducted the guests through the buildings, explaining the interesting and ingenious apparatus in the various departments, and striking experiments were made to demonstrate the varied activities of the institution. In the electrical department accurate capacity measurements at low frequencies and an electrical method of measuring frequency were to be seen, while in a hut in a meadow measurement of the amplifying power of valves at audible frequency, a three-electrode valve set to produce oscillations of audible frequency, and reception of continuous waves by the heterodyne method were demonstrated. In the electrotechnics laboratory the Paterson-Walsh electrical height indicator, which was used as part of the London air defences, and an instrument for testing radium-painted dials were on view, and tests were carried out on insulators for H.P. transmission (35,000 to 100,000 volts) under artificial rain, on arc lamps for searchlights, and on the heating effect in buried cables. In the heat division of the physics department, apparatus for determining the thermal conductivity of materials employed for the insulation of cold stores and for detecting the contaminated regions in thermo-elements, as well as an electrical instrument for indicating at a distance the depth of petrol in fuel tanks, were shown, while in the optics division tests for sextants, telescopes, binoculars, prisms, mirrors, lenses, &c., were explained.

Interesting exhibits were to be seen in the gauge and screw rooms of the metrology department, and in the Froude National Tank two different types of experiment were made on seaplane floats. In the metallurgy department demonstrations of rolling high-tensile aluminium alloys were given, and in the Wernher building exhibits of experimental light alloy products were on view, together with heating and cooling curves; the gradient furnaces and plotting chronograph were also seen in operation. Metallurgical microscopy was explained, and in the foundry the recuperative gas furnace and the electric "ring" furnace were seen in operation at high temperatures.

In the aeronautics department various demonstrations were made with different sizes of wind channels, and many interesting exhibits were on view. Finally, in the engineering department, the Lanchester worm-gear testing machine and apparatus for the determination of the viscosity of liquids at high pressure, for the measurement of journal friction, and for testing the wear of stranded cables were explained and seen at work, as were also an extensometer for use at high temperatures; a high velocity impact-testing machine; a wear-testing machine, and a fatigue-testing machine for alternating torsion tests.

Considerable additions have been made to the buildings, and those commenced in the early part of last year are now nearing completion. It was announced that the annual report of the laboratory would henceforth be presented at the end of the year, instead of, as previously, in June.

The important developments that have taken place during the war indicate the unremitting and enthusiastic activities of the first director—Sir Richard Glazebrook—who is to retire

in September. Here many of the wonders of the war had their origin, and they should be amongst the greatest assets of the reconstruction which is to come. Obviously, much of the work done was done in secrecy—some is to be secret for ever—it will suffice to state, however, that we owe the development of standardised and specialised production, which gave us the necessary volume of munitions, almost entirely to Teddington; and to the workers of this institution alone is due the creation of a second line of material, tested and ready for application, should we have been isolated from certain supplies; here were determined the conditions for automatic stability of aeroplanes which rendered night flying possible; and here also were performed a thousand and one tasks of unexpected and unusual character and of an unexampled urgency.

As the institution commenced to thrive upon its work the Treasury increased the annual grants about 14 or 15 hundred per cent., and gradually the Admiralty, War Office, Ministry of Munitions, and the Air Service generally, came to rely upon it for most things that mattered; during this period the usual advisory work, greatly intensified by the war, was also being carried out. The fact that the Government and manufacturers never looked to the staff at Teddington in vain is a striking testimony to their ability.

One of the many original devices designed since the war began is a curve plotting chronograph, the invention of Dr. W. Rosenhain, F.R.S., which enables the study of thermal changes in metals and alloys to be carried out with the necessary exactitude. In this device, a thermoelectric junction between the metal and the instrument moves a spot of light reflected from a galvanometer according to the temperature of the metal, and the tapping of a key by the observer registers inverse rate heating and cooling curves direct, without the tedious and unsatisfactory labour of counting chronograph tapes and curve plotting by hand.

Of equal importance, perhaps, was the testing and improvement of pyrometers and other special precision thermometers for checking heat treatments, and the improvement in constitution and production of non-magnetic materials for instruments, electrodes for spark plugs, and many other things. Further, knowledge acquired by the examination of the composition of metals by means of X-rays in conjunction with microscopical methods and other means will shortly be available for the service of the industry of the country.

In "wireless" some remarkable results have been obtained. Here Mr. F. E. Smith, F.R.S., working in conjunction with others, has helped in the development of directional wireless and the 3-electrode vacuum valve. By means of a small set of these valves connected in series and forming a receiving set, mounted in the basement of old Bushy House itself, messages sent out by a low-power apparatus on a ship with a wave length of 300 metres can be picked up and heard in any part of the room without the aid of the telephone cap. Tuned to a longer wave length, messages from the continental stations can be heard more clearly. For instance, messages from the Eiffel Tower can be heard distinctly and read more than 100 yards away on the ground floor.

A device invented and perfected by two of the staff at Teddington is the Paterson-Walsh electrical height finder for aircraft. Two planes, with telescopic attachments, are placed at a known distance apart, and, when an aircraft appears, an observer attached to each moves the plane until he has the ship in view through the telescope. When this condition is fulfilled he presses a switch communicating with the second observer, who in turn goes through similar operations. When both switches are pressed, showing that each observer has the ship in focus, the angles of the telescopes to the ground and the planes to each other are mechanically recorded, as is also the exact height at which the aircraft observed is flying.

In addition to its own duties, the staff at Teddington has given freely of its best members to other departments and other fields. Many of the younger members joined the Forces, and some who could ill be spared will never return; but an idea of the extension of the laboratory's activities can be had from the fact that the pre-war staff of 187 has been increased to 532, of whom some 200 are women, the additional members of the staff, other than those engaged on purely mechanical duties, being practically all science graduates of some recognised university.

French Views on Dealing with the Germans.—"Should we do business with the Germans?" inquires a correspondent of *l'Electricité*. "Why not? Our Allies the English and Americans, have not waited for the signing of Peace to realise some handsome profits." What we have to do, continues this correspondent, is to exclude the German traveller, so that Germany may not compete with the national industry in our market. This, however, alas, is in vain, for Boche material can be procured in France in good condition, so a firm informed him when applying for prices of electric apparatus. A Zurich correspondent of our contemporary reaffirms the first statement. "The English and Americans have already, at the present moment, begun to deal with the Germans on a great scale." Without presuming to prejudge the question, he adds that it is one which French economists and manufacturers should re-examine in all its complex bearings before coming to a final decision.

LEGAL.

MARCONI'S WIRELESS TELEGRAPH CO. *v.* THE CROWN.

(*Continued from page* 11.)

On Tuesday, July 1st, the SOLICITOR-GENERAL questioned Mr. Isaacs about an alternative proposal that the company should have a capital payment for erecting the stations instead of royalties on the gross receipts. The figure mentioned by the Solicitor-General which the company was to receive was £1,300,000, and he suggested that the cost of the work would have been £750,000, leaving the company £550,000.

Mr. ISAACS said he could not agree. The Marconi company had, he said, erected a long-distance station in Norway, the agreement being that they should receive 10 per cent. royalty on the receipts. There was a clause providing that the royalty might be commuted by payment of £30,000, but, witness said, there were many considerations which entered into the making of that clause.

The SOLICITOR-GENERAL: As the matter stands under the contract, it was clear that the Postmaster-General might have dispensed with the services of the Marconi Co.?

Mr. ISAACS: I don't think so. He could if he had found something else which superseded everything that the Marconi Co. was able to offer. Witness agreed that for strategical purposes there existed transmitting stations which were not dependent on Marconi patents. Witness said the Marconi Co. was interested in the present Poulsen patents. Mr. Isaacs characterised as "nonsense" a suggestion by the Solicitor-General that when the proper deductions were made the amount due to the company would be less than £50,000.

Re-examined by Sir EDWARD CARSON, witness said the company's remuneration was to be in royalties.

Was it ever suggested before you came into Court that the Government could erect an equally efficient system without any of the Marconi patents?—No.

Has any efficient commercial station been erected in these islands except under the Marconi patents?—Neither in these islands nor anywhere else to my knowledge.

The growth of wireless traffic was mentioned by Mr. Isaacs in connection with the Clifden-Glace Bay service. In 1913 there were transmitted from Clifden 581,000 words of Press messages, and in 1914 453,000 words. For the years 1916 and 1917 the Press traffic was respectively 16,000 and 5,000 words. This was due to the growth of the ordinary traffic which made it impossible to cope with the Press messages.

Mr. JOHN ST. VINCENT PLETTS stated that he had been employed by the Marconi Co. since 1899. He became deputy chief engineer in 1906, and head of the patent department formed in 1910. He declared that there were difficulties in connection with long-distance wireless as compared with short distance, which were never contemplated till they were met with. There was nothing to compare with the Marconi system for long-distance work. For commercial purposes there was no competition with the Marconi system, and there was no good system which could compete with it. Other systems had been tried, and in one instance another system—the Poulsen—was working, as had been stated, between San Francisco and Honolulu.

At the resumed hearing on Wednesday, July 2nd, Mr. Pletts was cross-examined by Mr. T. Terrell, K.C. for the Crown.

Mr. TERRELL said the Crown proposed to show that they need not have used any of the Marconi patents. The Marconi Co. declared that they could not have carried on a wireless service without using some of their patents, and he wanted to know which patents they said it would have been necessary to use.

Mr. PLETTS stated that each part of the transmission apparatus from the dynamo to the aerial was covered by patents. The company had special patented apparatus for receiving, but he did not think it had been decided what type of receiving apparatus was to be used on the Empire chain of stations.

Mr. TERRELL took witness through a long list of Marconi patents. The most important, said witness, was probably the 7,777 patent, which had by 1918 expired everywhere. The next most important patent, perhaps, was the Fleming valve, which was used for internal receiving and detecting.

Mr. TERRELL: As a detector, was that essential?

WITNESS: No, it was not essential. That patent, witness said, had run out in this country. Another patent related to a disk which made a musical note at the receiver that could be heard above the noise of the atmospherics.

The use by Mr. Terrell of the word "essential" in regard to several patents prompted his Lordship to ask: "What is the meaning of 'essential'? I thought you would admit the State would have the best."

Mr. TERRELL: That depends. The State would have an effective system, but if there was something which was a little better, but not so much better as to induce the State to pay 10 per cent. royalty, the State would be entitled to use the alternative, as a matter of economy.

Mr. JUSTICE LAWRENCE: I don't see how I am to determine the extent to which the P.M.G. would regard efficiency as satisfied if it was mere economy. It seems to me the scheme was really intended to have as good a wireless service as he reasonably could, not to have one as cheap as he reasonably

could. Is not the point whether it would have been commercially useful?

Mr. TERRELL: I will adopt that term. It is a good term and a true term.

In the course of his further cross-examination as to the various patents in which the Marconi Co. were interested, Mr. Terrell challenged the validity of one which had reference to sectional steel masts, when Sir Edward Carson raised the point that his Lordship under the reference ought not to try the validity of any patent.

His LORDSHIP thought the matter had better be reserved. Unless all the other patents were unavailable from having expired this question would not arise. His direction, he said, was to try the question of compensation, and there was no order to try validity of patents.

Continuing his cross-examination, Mr. TERRELL asked: Is this particular patent essential to any station?

WITNESS replied in the negative, adding, "but it is a convenient form of mast and is no doubt much cheaper than other forms."

Having taken the witness through the list of patents, Mr. TERRELL remarked that he was going to one of the alternatives which the P.M.G. could have adopted instead of the Marconi patents. He put in a blue print drawing of a Poulsen transmitter.

His LORDSHIP: Will this not involve me in an inquiry as to the terms on which this could be used?

Mr. TERRELL: No. This contains nothing that is not open to the whole world.

Witness was questioned about various details of the transmitter. He described the blue print as "very diagrammatic," and said that some of the parts of the apparatus might involve the use of some of the Marconi patents. What was shown on the diagram could not be used for any high powered, long-distance wireless. Upon further cross-examination relating to details of the Poulsen system, Sir Edward Carson commented: "This is very inconvenient."

His LORDSHIP: It is. I had no idea I was to be plunged into this sort of inquiry when I undertook the case.

Counsel asked witness: "At the end of 1918 had not the Poulsen arc system been so developed as to be a practical alternative to anything the Marconi Co. possessed without infringing any of the Marconi patents?"

WITNESS: No. I don't think it is even to-day anything like an alternative. Its efficiency is nothing like so great.

The Poulsen receiving apparatus, witness said, also appeared to involve the use of some of the Marconi patents.

At the conclusion of Mr. Pletts's cross-examination, Sir EDWARD CARSON asked leave to defer the re-examination of the witness till they had been furnished with a complete specification of the alternative Poulsen system which had been referred to. He complained that the Crown were trying to say to the whole world: "You can use wireless without paying anything at all for it."

Mr. TERRELL: That is true.

Sir EDWARD CARSON: That is an attempt to smash the Marconi organisation throughout the entire world.

Mr. TERRELL: Is there at this moment any suggestion that the Marconi Co., with their principal patents gone, have a complete monopoly of wireless?

Sir EDWARD CARSON: Whoever said that?

His LORDSHIP permitted the re-examination of Mr. Pletts to be deferred, and the hearing was again adjourned.

The hearing was resumed on Thursday (July 3rd) when Mr. Sidney Pears, a member of the firm of Cooper Bros. and Co., chartered accountants, who prepared the figures of the estimated royalties due to the Marconi Co., was examined by Mr. Leslie Scott, K.C., M.P. He said that the estimated wireless traffic that would have been done by the stations, calculated on post office figures of cable traffic done, was 33,000,000 words per annum for the 28 years of the contract.

Mr. LESLIE SCOTT mentioned that the Marconi Co. had increased their capacity for dealing with traffic between two stations from 100 words a minute, or 104,000,000 words a year, to 300 words a minute. For this increase the duplex system was responsible, enabling a single station to do 300 words a minute each way—a total of 600 words.

WITNESS stated that on the basis of figures of cable traffic for 1913 the total amount of royalties which would have been payable to the company for the 28 years of the contract would have been £8,000,000. The cash value of those royalties, on a 5 per cent. basis, at the present time was £3,707,000.

In cross-examination, witness said that the week-end cable traffic had increased from about 1,000,000 words a week in 1913 to more than 6,000,000 in 1917.

Mr. S. G. WARNER, actuary to the Law Union and Rock Insurance Co., stated that in his opinion the proper rate to apply for payment for these royalties was 4½ per cent. His conclusion in this respect was made with due regard to the issue of the Victory Loan, which was certain to rise in value as time went on.

Mr. GODFREY ISAACS was recalled to deal with some of the points of detail upon which Mr. Pears had given evidence, and the hearing was adjourned.

On Friday Mr. HUNTER GRAY, K.C., recalled Mr. Pletts, and asked: "Do you know of any system which compares in efficiency with the Marconi Co. that does not involve the use of the Marconi patents?"

WITNESS: No, I do not.

Mr. HUNTER referred to the report of Lord Parker's Committee in 1913 that the Marconi system appeared to be the only system capable of fulfilling the requirements of an Imperial wireless service, and asked witness what his view now was.

Mr. PLETTS: I think that statement is still quite true, and in some respects perhaps more so because the requirements are more difficult to-day. More stations are talking to-day, and some of the improvements, particularly for the elimination of interference, are more important.

In your opinion does the system shown on the blue plan which has been put in and the specification comply with the definition of the expression "long-distance installation? —No, I don't think so. The system shown here is not an up-to-date system, and even the apparatus here has been improved upon. This could not be worked with high power.

Using high power, said witness, one of the great difficulties with the Poulsen system was the great heat generated in the arc. Patents had been devised to overcome that.

Mr. HUNTER GRAY: Mr. Pears mentioned a patent devised by the manager of the Russian Marconi Co. Is it a system equally efficient as the Marconi system?—No. It requires many additions which are patented.

Mr. ANDREW GRAY, chief engineer to the Marconi Co., said he agreed with Mr. Pletts's evidence as to the want of efficiency of the alternative system.

Sir EDWARD CARSON said this concluded the case for the Marconi Co.

The ATTORNEY-GENERAL (Sir Gordon Hewart, K.C.), for the Crown, stated that the Marconi Co.'s claim to receive £7,181,000 was a claim to receive the equivalent of nearly five times its capital. The sum claimed was an amount which at 5 per cent. interest would produce £365,000 a year, or about 23 per cent. on the capital of the company in perpetuity. In consequence of the war the carrying out of the contract involved difficulties, and negotiations took place between the Post Office and the Marconi Co. Experience had proved that the Marconi Co. were hard bargainers, and finally the Cabinet took the matter out of the hands of the Post Office and directed the abandonment of the contract. There was a prolonged effort to work out some agreement with the company on reasonable terms, and that had all along been the attitude of the Post Office. There was no wish to ruin the Marconi Co. as had been said. On the contrary, it was the refusal of the company of all reasonable terms, and the exorbitant nature of the claim they had put forward which involved them in any jeopardy there might be. The Attorney-General pointed out that the erection of the stations involved an expenditure of £360,000, and asked whether it could be suggested that the company had by the abandonment of a scheme involving an outlay of that amount, lost a sum in royalties which was estimated at £7,000,000. If a system of equal efficiency could have been found it would have been the duty of the P.M.G. to put an end to the payment of royalties. He intended to prove two things: (1) That up to the end of 1918 no commercial wireless messages could have been or would have been allowed to be sent; (2) after that period it would have been possible, apart from the existing Marconi patents, to provide substantially an equally efficient system. That was not an hypothesis, but was based on experience in other countries, notably America, France, and Italy. In the event of his Lordship being satisfied that that was the fact, there was an end of the company's claim. In the absence of an alternative system of equal efficiency, his Lordship's task was to inquire what was a fair amount of compensation to pay the company. He submitted that the company's claim was grossly exaggerated. The Attorney-General added that he would show that even with all the assumptions that had been made on behalf of the company, the true figure of damages was in the neighbourhood of £50,000.

Mr. F. J. BROWN, an assistant secretary of the Post Office, in charge of the foreign and wireless telegraph branch, said the Government were spending a large sum on wireless research, and the progress made had been enormous. Witness said in his view the royalties from the stations would have been comparatively small, because the traffic would have been comparatively small. If contrary to that view the traffic had been large, as practical people, the Post Office would have had to consider the royalties paid in comparison with the cost of replacing the system by some equally efficient, if not more efficient system, if they could have found one. Witness said that the basis of the Marconi Co.'s claim for £7,000,000 was the war traffic of the years 1916 and 1917. The war traffic was out of all proportion to the traffic in peace years, and from his study of the matter he formed the view that it was entirely illusory to take war years as the basis of calculation for peace years.

The hearing was adjourned.

BREACH OF REGULATIONS AT SHEFFIELD.

AT the Sheffield Police Court, on July 3rd, the Sheffield Corporation were fined £20 for failing to comply with the regulations governing the generation and use of electrical energy.

According to the report of the *Sheffield Independent*, Mr. John Law, H.M. Inspector of Factories, explained that at the Neepsend power station of the Sheffield Corporation, a new panel was being put on the switchboard to replace one which

had been burnt out. The particular section concerned was made dead, but from the adjoining section some live wires hung over. These should either have been tied up or screened off. While a student, Robert Varley, was helping to fix a bolt with a spanner, an explosion occurred, owing to his arm or the spanner catching the live wires. The youth was burnt on the face and hands and blinded for the time, though he was now regaining his sight.

Mr. E. B. GIBSON, Deputy Town Clerk, explained that to have put the whole switchboard out of action would have thrown twenty or thirty thousand people out of work, and the shortest time for the repairs would have been two weeks.

LANGTON *v.* BARTSCHI.

IN the Chancery Division, on July 2nd, Mr. Justice Astbury dismissed with costs an action by Edward Charles Langton against Otto Bartschi, by which the plaintiff claimed under an agreement that he was entitled to a fourth share in letters patent 19,963 of 1912 for improvements in magneto electric machines, granted to the defendant. The particular invention related to pole shoes, a component part of the magneto.

His LORDSHIP, in giving judgment, said the defendant relied on the defence that he signed this agreement on the faith of a promise by the plaintiff to obtain the signature of one William Albert Fox, and only on that condition, and that the condition not having been carried out, the plaintiff could not sue on the agreement. It ought to be observed in the defendant's favour on this point that the plaintiff swore in the witness-box that although he knew that the defendant wished to have Fox's signature to the agreement, all he cared about was to get the defendant's signature, and he cared nothing whether Fox signed or not. The action wholly failed.

WATSON, MARSH & CO. *v.* COHEN.

INJUNCTION TO RESTRAIN TRADING.

IN the Chancery Division, on July 4th, Mr. Justice Peterson heard a motion for an injunction by Watson, Marsh & Co., electrical engineers, to restrain George Cohen, now carrying on business at King Street, Cheapside, as the Reliance Electrical & Maintenance Co., of Golders Green, from carrying on business within a 3-mile radius of 24, Golders Green Road.

It was stated on the plaintiff's behalf that the defendant sold his business at Golders Green to the company, that he was living at Woodstock Road, about a hundred yards from Golders Green Road, and that he used the telephone from his place in King Street to his private house for the purpose of getting orders for work within the radius. This radius was established by a deed which he entered into with the company when he sold the business to them.

An affidavit by the defendant was read in which he denied the allegation that he had broken the covenant.

His LORDSHIP granted an interim injunction over the following week.

NEW PATENTS APPLIED FOR, 1919.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS SEFTON-JONES, O'DELL AND STEPHENS (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

15,735. "Control switch for dynamos or electric generators." J. BUSH. June 23rd.

15,742. "Electrically operated horns for motor vehicles." G. Frecheville. June 23rd.

15,748. "Electric induction apparatus." British Thomson-Houston Co. (General Electric Co.) June 23rd.

15,751. "Electric water heaters." W. F. Cutler. June 23rd.

15,755. "Electric gramophone drive." F. MYERS. June 23rd.

15,758-15,760. "Electric cooking or heating vessels and apparatus." C. H. Lauth. June 23rd.

15,770. "Dry-cell batteries." H. R. PALMER. June 23rd.

15,789. "Electric contactor switches." V. BREEZE and A. WEST & Co. June 23rd.

15,806. "Terminal connectors." J. W. JORDAN. June 23rd.

15,821. "Ignition device." J. H. FAGAN. June 24th.

15,823. "Electro-deposition of metals." J. H. B. JACOMBS. June 24th.

15,832. "Coupling for electrical conduits." J. JAGGER. June 24th.

15,880. "Electric incandescent lamps." BRITISH THOMSON-HOUSTON Co. (General Electric Co.) June 24th.

15,891. "Housings and casings for electrical switchgear." V. BREEZE and A. WEST & Co. June 24th.

15,895. "Telephone transmitters and mouthpieces, &c., therefor." H. J. PALMER and TELEPHONE MANUFACTURING Co. June 24th.

15,905. "Electrical regulating switches." C. H. COLES. June 24th.

15,910. "Field telegraph and telephone exchanges." A. A. CLARKE and E. E. PRICE. June 24th.

15,915 & 15,921. "Sparking plugs." J. SENDER. June 24th.

15,932. "Magnetic indicator." C. D. FLINT. June 25th.

15,937. "Obtaining alternating currents from existing three-phase systems." A. M. TAYLOR. June 25th.

15,948. "Sparking plugs." W. H. HARRIS. June 25th.

15,972. "Contact breakers for magnetos." D. C. DINGLEY and G. MAJOR. June 25th.

15,975. "Sanitary protector for telephone, &c., mouthpieces." F. HONE. June 25th.

16,024. "Grids for plates of electric storage batteries." H. C. SMITH and VAN RADEN & Co. June 25th.

16,048. "Current, voltage or speed regulator." R. W. M. THOMSON. June 26th.

16,051. "Magnetos. W. E. WALMSLEY. June 26th.

16,055. "Sparking plugs." F. G. HEATH. June 26th.

16,071. "Ignition switches for motor vehicles." C. H. LUKE. June 26th.

16,077. "Electrically heated clothes pressing machine." M. COHEN. June 26th.

16,079. "Sparking plugs." W. J. GEDDES. June 26th.

16,088-9. "Electrically heated liquid heaters." C. H. LAUTH. June 26th.

16,090. "Electric heating and cooking apparatus." C. H. LAUTH. June 26th.

16,091. "Electric cooking and heating of fatty products." C. H. LAUTH. June 26th.

16,118. "Electric heating elements." A. SELVATICO. June 26th.

16,125. "Manufacturing incandescent lamps." BRITISH THOMSON-HOUSTON Co. (General Electric Co.) June 26th.

16,126. "Dynamo-electric machines." BRITISH THOMSON-HOUSTON Co. (General Electric Co.) June 26th.

16,130. "Attachment for mouthpieces of telephone transmitters." J. STODDART. June 26th.

16,134. "Storage battery separators." H. L. BOYER. June 26th.

16,140. "Electric heating apparatus." E. B. MILLER and R. C. WRENCH. June 26th.

16,141. "Electric switches." R. C. WRENCH. June 26th.

16,154. "Apparatus for electrolysing liquids." J. S. WITHERS. (National Electro-products, Ltd.) June 26th.

16,165. "Telephones." A. GOLDSTEIN and H. LEVI. June 27th.

16,173. "Electrical switchgear, &c." HALL BROS., S. E. HALL & W. HALL. June 27th.

16,188. "Electric welding." R. F. WOODBURN. June 27th.

16,201. "Operating and tripping mechanism of oil-break electric switches." R. T. NORTON. June 27th.

16,224. "Apparatus for indicating faults in internal-combustion engine ignition system." E. L. GRANT June 27th.

16,228. "Electric transformers." H. L. CROWTHER. June 27th.

16,230. "Electric incandescent lamps." BRITISH THOMSON-HOUSTON Co. (General Electric Co.) June 27th.

16,232. "Electric welding." A. E. MCCARTHY, H. MARTIN and L. J. STEELE. June 27th.

16,248. "Electrical measuring-instruments." BRITISH WESTINGHOUSE ELECTRIC & MANUFACTURING Co. and W. H. L. WOOD. June 27th.

16,255. "Electrical terminals, &c." N. C. F. JENSEN and M. J. E. TILNEY. June 27th.

16,256. "Fault localisation for underground electric cables." CALLENDER'S CABLE & CONSTRUCTION Co. and C. W. KAY. June 27th.

16,268. "Composition for insulating and waterproofing electrical elements." G. TUCKER. June 28th.

16,295. "Coating metal upon metal, &c., surfaces for electrotyping, &c." J. HARRIS and T. R. HARRIS. June 28th.

16,302. "Electrodes for electric furnaces." D. F. CAMPBELL, CAMPBELL, GIFFORD & WAITE, W. S. GIFFORD and H. S. WAITE. June 28th.

16,306. "Grating for telegraphic transmission of Morse code characters." L. SEMAT. June 28th.

16,310. "Apparatus for obtaining current of low voltage from electric lighting circuit." W. A. MONTGOMERY. June 28th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1917.

6,110. ELECTRIC IGNITION APPARATUS FOR INTERNAL COMBUSTION ENGINES. C. A. Atherton. April 30th, 1917. (127,616.)

6,433. THERMIONIC DEVICES PARTICULARLY FOR USE IN WIRELESS TELEGRAPHY. Marconi's Wireless Telegraphy Co. and I. Shoenberg. May 5th, 1917. (127,634.)

6,794. EMPLOYMENT OF THERMIONIC DEVICES FOR MAGNIFICATION PURPOSES. Marconi's Wireless Telegraph. May 12th, 1917. (127,651.)

6,993. MEANS FOR SEALING AND OPENINGS IN THE ROOF AND WALLS OF AN ELECTRIC FURNACE THROUGH WHICH THE ELECTRODES ARE INTRODUCED. T. H. Watson & Co., H. A. Greaves and H. Etchells. May 16th, 1917. (127,661.)

7,274. TELEPHONE AND LIKE RECEIVERS OR RELAYS. S. G. Brown. May 19th. (127,669.)

7,427. WIRELESS TELEGRAPHIC APPARATUS. British Thomson-Houston Co. (General Electric Co.) May 23rd, 1917. (127,675.)

1918.

1,333. ELECTRIC LAMP BRACKETS. W. J. Revell. July 22nd, 1918. (127,682.)

7,775. MEANS FOR IGNITING THE CHARGE IN INTERNAL-COMBUSTION ENGINES. G. M. Blackstone, F. Carter and E. Carter. November 8th, 1918. (127,698.)

9,016. ELECTRIC SPARK CAPS. E. A. Watson and M-L Magneto Syndicate. May 31st, 1918. (127,707.)

9,346. VACUUM ELECTRIC DISCHARGE DEVICES. H. W. Edmundson, W. T. Munro and British Thomson-Houston Co. June 6th, 1918. (127,724.)

9,681. LAPPING MACHINES FOR COVERING ELECTRIC CONDUCTORS. C. J. Beaver, J. Stratton and E. A. Claremont. June 13th, 1918. (127,732.)

9,682. LAMP SHADES OR REFLECTORS. Britannia Lamp and Accessories Co. and R. Cox. June 12th, 1918. (127,733.)

10,331. AUTOMATIC ELECTRIC SWITCHES. Lund & Lawerentz Aktieselskab. June 23rd, 1917. (117,082.)

10,360. ELECTRIC TIME LIMIT DEVICES FOR ELECTRO-MAGNETIC SWITCHES. British Thomson-Houston Co. (General Electric Co.) June 24th, 1918. (127,750.)

11,484. LEADING-IN CONDUCTORS FOR ELECTRIC LAMP BULBS AND THE LIKE. Nihon Denki Kogyo Kabushiki Kaisha and T. Yanai. July 12th, 1918. (127,756.)

11,587. TELEPHONE RECEIVERS. H. E. Parry. July 15th, 1918. (127,758.)

11,647. ELECTRIC SWITCHES FOR USE IN GOVERNING FLUID PRESSURE. British Thomson-Houston Co. (General Electric Co.) July 16th, 1918. (127,759.)

1919.

5,463. DYNAMO ELECTRIC MACHINES. J. J. Linebaugh. March 6th, 1918. (124,206.)

Ramsay Memorial Fellowships.—*The Times* states that the trustees of the Ramsay Memorial Fellowship Funds will consider this month applications for Fellowships of the value of £250 a year, with an expenses grant not exceeding £50, tenable normally for two years, with a possible extension to a third year. The Fellowships are for those who have already graduated with Honours in Chemistry. Applications must be received not later than July 14th, by the Secretary, University College, London (Gower Street, W.C. 1).